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Trajectories of Persistence: Success and Risk Factors in an Teacher Education Program in Exact Sciences

Trajetórias de Persistência: Fatores de Sucesso e Risco em um Curso de Licenciatura em Ciências Exatas

Trayectorias de Persistencia: Factores de Éxito y Riesgo en un Curso de Pedagogía en Ciencias Exactas

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Abstract

University dropout is a complex challenge, especially in Exact Sciences programs. The aim of this article was to investigate the relationships between self-efficacy beliefs, sense of belonging, and perceived curricular relevance with the persistence intentions of 37 students enrolled in an Exact Sciences Teacher Education Program offered at an off-campus site of the Federal University of Rio Grande. Grounded in Tinto's (2017) Student Motivation Model of Persistence, the study adopted a mixed analytical approach. The quantitative stage, conducted through a questionnaire, demonstrated a positive and moderate correlation between persistence intention and the three constructs evaluated (self-efficacy, sense of belonging, and perceived curricular relevance). However, the qualitative analysis of seven individual cases revealed that the academic trajectory is multifaceted, with the context and dynamics of an off-campus site exerting strong influence. Students with high predictive indicators of success dropped out due to external factors, such as work overload and socioeconomic vulnerabilities. Conversely, students with a low sense of belonging persisted in the program, supported by high self-efficacy and clear external goals. It is concluded that persistence is determined by a complex interaction of factors, reinforcing the need for personalized institutional actions that promote pedagogical support and a sense of community.

Keywords: persistence, dropout, self-efficacy, sense of belonging, perception of curricular relevance

Resumo

A evasão universitária é um desafio complexo, especialmente em cursos de Ciências Exatas. O objetivo deste artigo foi investigar as relações entre crenças de autoeficácia, senso de pertencimento e percepção da relevância curricular com a intenção de persistência de 37 alunos de uma Licenciatura em Ciências Exatas, ofertada em um *campus* fora da sede da Universidade Federal do Rio Grande. Fundamentada no Modelo de Motivação da Persistência do Estudante de Tinto (2017), a pesquisa adotou uma abordagem analítica mista. A etapa quantitativa, realizada por meio de questionário, demonstrou uma correlação positiva e moderada entre a intenção de persistência e os três construtos avaliados (autoeficácia, senso de pertencimento e percepção de relevância curricular). No entanto, a análise qualitativa de sete casos individuais revelou que a trajetória acadêmica é multifacetada, onde o contexto e as dinâmicas de um *campus* fora de sede exercem forte influência. Alunos com altos indicadores preditores de sucesso evadiram devido a fatores externos, como sobrecarga de trabalho e vulnerabilidades socioeconômicas. Em contrapartida, discentes com baixo senso de pertencimento persistiram no curso, amparados por uma alta autoeficácia e por metas externas claras. Conclui-se que a persistência é determinada por uma complexa interação de fatores, reforçando a necessidade de ações institucionais personalizadas que promovam o apoio pedagógico e o senso de comunidade.

Palavras-chave: persistência, evasão, autoeficácia, senso de pertencimento, percepção da relevância curricular

Resumen

La deserción universitaria es un desafío complejo, especialmente en las carreras de Ciencias Exactas. El objetivo de este artículo fue investigar las relaciones entre las creencias de autoeficacia, el sentido de pertenencia y la percepción de la relevancia curricular con la intención de persistencia de 37 estudiantes de una Pedagogía en Ciencias Exactas, impartida en un campus regional de la Universidad Federal del Rio Grande. Fundamentada en el Modelo de Motivación para la Persistencia Estudiantil de Tinto (2017), la investigación adoptó un enfoque analítico mixto. La etapa cuantitativa, realizada mediante un cuestionario, demostró una correlación positiva y moderada entre la intención de persistir y los tres constructos evaluados (autoeficacia, sentido de pertenencia y percepción de la relevancia curricular). Sin embargo, el análisis cualitativo de siete casos individuales reveló que la trayectoria académica es multifacética y que el contexto y las dinámicas de un campus regional ejercen una fuerte influencia. Estudiantes con altos indicadores predictores de éxito desertaron debido a factores externos, como la sobrecarga de trabajo y vulnerabilidades socioeconómicas. En contraste, discentes con un bajo sentido de pertenencia persistieron en la carrera, amparados por una alta autoeficacia y por metas externas claras. Se concluye que la persistencia está determinada por una compleja interacción de factores, lo que refuerza la necesidad de acciones institucionales personalizadas que promuevan el apoyo pedagógico y el sentido de comunidad.

Palabras clave: persistencia, deserción, autoeficacia, sentido de pertenencia, percepción de la relevancia curricular

Introduction

Understanding the factors that lead to university dropout has been a persistent focus in educational research (e.g., Palharini, 2004; Garcia & Gomes, 2022; Barroso et al., 2022; Franco et al., 2022; Carniel & Espinosa, 2024). By examining the reasons students leave their courses, researchers have shifted their attention toward the elements that support academic persistence. This change in perspective seeks to inform the development of targeted interventions aimed at reducing dropout, rather than simply responding to it. Identifying the factors that foster student retention enables the creation of proactive strategies to strengthen students' engagement with both their institution and program, ultimately enhancing the likelihood of successful course completion.

In the context of persistence, from an institutional perspective, Vincent Tinto (1975) proposed the *Student Integration Model*, which emphasizes two key dimensions for student retention: academic integration and social integration. In 2017, Tinto shifted his perspective, moving from a focus on student retention through institutional lenses to a student-centered approach, and introduced the *Student Persistence Motivation Model*, which emphasizes students' intentions to persist. He argues that students' motivation to continue in higher education depends not only on the goal of completing their program, but also on three main psychological constructs: their perception of their own ability to meet academic demands (self-efficacy beliefs), their sense of belonging and recognition within the university community (sense of belonging), and the value they attribute to the course content and studies undertaken (perceived curricular relevance).

Building on this model, recent studies have examined student persistence by assessing these psychological constructs (e.g., Moraes, 2020; Pigosso et al., 2020; Espinosa et al., 2023; Calsing & Heidemann, 2023; Franco et al., 2024; Ribeiro et al., 2025). However, these investigations are generally conducted in universities located in major urban centers, typically state capitals in Brazil. Public universities outside of these central locations present particular characteristics that warrant investigation, as they often experience equal or even higher rates of university dropout (Andifes, 2012; Gilioli, 2016). Previous research also lacks an in-depth analysis of specific cases of students who do not fit the theoretical model—namely, those enrolled with the intention to persist but exhibiting low self-efficacy, sense of belonging, and perceived curricular relevance. Research in this direction could shed light on potential limitations and adaptations of Vincent Tinto's model for the Brazilian context in general, and for off-site campuses in particular.

Thus, the aim of this study was to examine the relationships between self-efficacy beliefs, sense of belonging, and perceived curricular relevance with the persistence intentions of students enrolled in the degree in teaching Exact Sciences at the Federal University of Rio Grande, Santo Antônio da Patrulha campus. Additionally, we investigated the persistence motivations of students who exhibited low levels of self-efficacy, sense of belonging, perceived curricular relevance, and/or persistence intention.

For this reason, we conducted an empirical study with students from this specific program. We received 37 completed questionnaires from a total of 64 potential participants. The responses were analyzed using descriptive and inferential statistical methods, as well as a qualitative analysis of the students' answers. In the following sections, we present the theoretical framework, research methodology, results and discussion, and, finally, conclusions and implications.

Theoretical Background

Research on higher education dropout emerged in the United States during the 1970s, driven largely by sociological studies. Scholars such as Spady (1970), Tinto (1975), and Pascarella and Terenzini (1977) established a fundamental principle that has guided subsequent research: understanding student outcomes requires an analysis that goes beyond individual characteristics and considers the social and institutional context in which decisions are made. Vincent Tinto's (1975) Student Integration Model became particularly influential, proposing that student success depends on their ability to integrate into the academic and social systems of the institution, a continuous process that ultimately leads to either completion or dropout (Aina et al., 2022).

In Brazil, concern with this issue gained momentum in the 1990s, driven by policies aimed at evaluating the quality of higher education, such as the Brazilian Universities Institutional Evaluation Program (PAIUB). Early research in the country was predominantly diagnostic in nature, focusing on identifying the factors and causes of dropout. National literature reviews consistently point to a recurring set of causes,

particularly in Exact Sciences programs, including the undervaluation of the profession and low remuneration, traditional teaching methods, difficulties in balancing studies with other activities, learning challenges with specific subject content, and financial constraints (e.g., Garcia & Gomes, 2022; Carniel & Espinosa, 2024). Factors related to academic performance, especially in introductory courses, as well as students' beliefs, goals, and motivations, are also frequently highlighted.

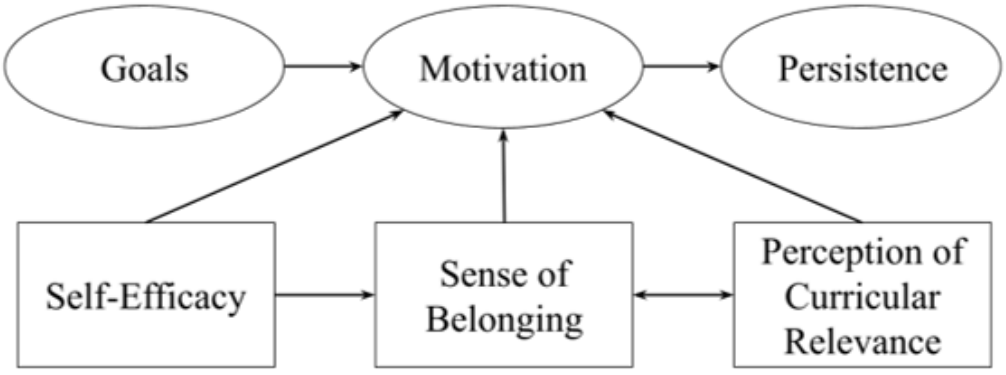
As the field matured, researchers began to recognize the complexity and limitations of the term "dropout," which often does not distinguish between permanent withdrawal and student mobility to other courses or institutions (Coimbra et al., 2021). Furthermore, the focus on identifying factors that cause dropout did not necessarily translate into effective actions to address the phenomenon. This realization prompted a shift in perspective, moving the focus from dropout to the study of student persistence (e.g., Tinto, 2012, 2017).

This new approach was strongly influenced by Tinto's work (2012), which argued that understanding the reasons for student departure is not the same as understanding the reasons for persistence and success. Consequently, persistence came to be viewed as an active process, driven by the student throughout their academic trajectory (Tinto, 2017), although research on this topic remains less abundant than studies on dropout. Within this framework, Tinto's *Student Persistence Motivation Model* (2017) has inspired several recent studies and has also been adapted to support different contexts, such as faculty persistence in Beatson et al. (2021).

In this model, Tinto (2017) emphasizes that, despite the existence of various approaches to retention from the perspective of institutional actions, it is crucial to recognize the student's persistence intention. From this standpoint, additional institutional interventions can be proposed (Tinto, 2022). Tinto's (2017) model can be summarized in the diagram in Figure 1, which presents the key constructs underlying student motivation and persistence.

Figure 1

Student Persistence Motivation Model



Source: Tinto (2017, p. 3). Adapted from Tinto (2022).

According to this model, a student's persistence in each undergraduate program is intrinsically linked to their *motivation* to complete it (Tinto, 2017). However, motivation can be unstable and variable, and it is influenced by the student's perceptions of their own abilities (self-efficacy), their social and academic sense of belonging, and the value they attribute to the program's curriculum. Thus, it is clear that having the goal of completing the program is necessary, but not sufficient, for actual completion. Some students enter their desired undergraduate program with the intention of transferring to another institution to complete it, while others "may not intend to transfer but do not place great importance on completing their degree in the institution in which they first enroll" (Tinto, 2017, p. 2).

Furthermore, the goal may differ among students. Some may be primarily concerned with their learning, autonomy, or professional career, while others may focus on the student support services provided by the university. In some cases, there may be no clear goal at all. When the *goal* is unclear or weakly established, any negative experience at the university can be sufficient to trigger dropout. Tinto focuses on students who, upon entering an undergraduate program, have some goal and/or commitment regarding its completion.

Self-efficacy is defined as an individual's judgment of their own ability to successfully perform a specific activity or task (Bandura, 1986). Self-efficacy is not generalized across all skills; for example, a student may have high self-efficacy in reading but low self-efficacy in completing physics exercises. In the context of dropout, and specifically within Tinto's model, self-efficacy refers to the beliefs a person holds about their ability to cope with the academic and social demands of the university environment, such as performing well on exams and progressing through course semesters (Tinto, 2017; Moraes, 2020). Technical ability and self-efficacy are interdependent: a lack of self-efficacy can hinder even a capable student, while high self-efficacy cannot compensate for a lack of knowledge. Accordingly, Tinto (2017) emphasizes that institutions should monitor these beliefs, particularly during the first year of undergraduate studies, a critical adaptation period often marked by frustrations stemming from secondary education.

The *sense of belonging* is related to the extent to which an individual feels integrated and included within a group, that is, the degree to which students perceive themselves as members of a community of faculty, staff, and peers and feel that their participation is valued and important to the group (Tinto, 2017, 2022). A low sense of belonging, or feelings of exclusion or displacement, can lead to course withdrawal. Tinto (2017) emphasizes that actions taken by program coordinators and faculty are essential, as they reflect institutional commitment and shape the academic climate. However, he also notes that even a single negative interaction can be sufficient to undermine a student's sense of belonging.

Perceived curricular relevance refers to the connections that students make between academic requirements (courses, teaching methods, and instructor behavior) and the outcomes they aim to achieve. This perspective is multifaceted: students focused on personal development value theoretical depth, whereas those oriented toward

employability prioritize practical applicability. Although this dimension also considers whether students feel that instructors value their learning, Moraes (2020) noted that this aspect shows a lower correlation with the rest of the construct. In any case, when students are unable to relate the content to their personal or professional goals, the curriculum becomes irrelevant. This disconnect hinders engagement and emerges as a critical factor contributing to dropout.

For students to make a high-quality course choice, it is important that they identify with the program. It is also necessary for students to perceive the curriculum as essential and preparatory for their future profession. Difficulties in relating course content to professional practice can influence the decision to remain in or leave the program. A curriculum perceived as unrewarding, irrelevant, or of low quality may contribute to student dropout. These issues are directly related to the construct of perceived curricular relevance.

According to Tinto (2017), it is essential for higher education institutions to understand students' perceptions of the factors that most influence their decisions to persist or drop out, because only by understanding them the institutions can act "to impact those decisions in ways that enhance the likelihood of greater persistence while also addressing the continuing gap in college completion between students of different attributes and backgrounds" (Tinto, 2017, p. 11). These are the three constructs that predict dropout within Vincent Tinto's (2017) model.

In summary, Tinto's (2017) Student Persistence Motivation Model emphasizes the importance of examining academic experience from the students' perspective, taking into account factors such as self-efficacy, sense of belonging, and perceived curricular relevance. These elements are essential for understanding the motivations and challenges that affect program persistence. By acknowledging the complexity of these variables, institutions can develop more effective strategies to promote persistence, thereby reducing dropout rates. Consequently, understanding these dimensions enables a more personalized and inclusive approach, which is crucial for addressing disparities in undergraduate program completion.

Empirically testing this theory, the study conducted by Beatson et al. (2024) applied Tinto's (2017) theoretical success model to the context of an accounting course, where 132 students from a university in New Zealand were surveyed at the beginning and end of the semester. The aim was to examine the influence of self-efficacy, sense of belonging, motivation, and perceived curricular relevance on students' academic performance. The main findings revealed that self-efficacy and sense of belonging are direct and significant predictors of student success, measured by final grades, and their impact is greater than that of motivation when all factors are considered together. Notably, perceived curricular relevance was not significantly related to performance, which the authors suggest may be characteristic of vocational courses[1] where relevance

1 Beatson et al. (2024) associate this qualification (vocational program) with a curriculum focused on the development of technical skills, resulting from a combination of contributions from the 'business sector, the profession, and the university'.

is assumed. Finally, the study also observed that, over the course of the semester, levels of motivation, belonging, and perceived relevance decreased significantly, while self-efficacy remained the most stable construct.

In a different context, the study by McClusky and Allen (2023) investigated the factors contributing to the persistence and success of Emirati Muslim female university students at a public university in the United Arab Emirates, a setting where women outperform men in public higher education, yet societal norms remain strongly male-dominated. The research employed a qualitative approach, using questionnaires and interviews with 22 students. The data were analyzed through Tinto's (2017) persistence model. According to the findings, students' motivation is multifaceted. Their goals combine personal empowerment with the pursuit of financial independence. Their self-efficacy was strengthened as they overcame challenges such as language barriers and developed critical thinking skills. The sense of belonging was strong, with students valuing the university as a safe environment, although gender segregation was perceived as a professional obstacle. Finally, perceived curricular relevance was positive, influenced by autonomy of choice and pedagogical approaches that encouraged independent research and creativity. Collectively, these constructs resulted in high motivation, driving persistence that balances the desire for personal autonomy with loyalty to their culture and family.

In the Brazilian context, Ribeiro et al. (2025) investigated how Tinto's psychological predictors of persistence vary according to students' social backgrounds. The study, conducted with 367 undergraduates in Exact Sciences (STEM) programs at a public university in southern Brazil, identified four distinct student profiles: "on the edge" (with low scores across all predictors), "underrepresented" (low sense of belonging but high perceived curricular relevance), "working" (balancing employment and studies, with moderate to high persistence intention), and "privileged" (with the most favorable socioeconomic conditions and the highest persistence scores). The authors highlight that, although adaptation to the academic environment is essential, students' social background serves as a central mediator in how they access and interpret institutional experiences, requiring university policies to recognize structural inequalities when promoting persistence.

In summary, the research trajectory on this topic has evolved from an initial sociological approach focused on student–institution interaction to a diagnostic phase aimed at identifying causes, culminating in a more recent and proactive perspective centered on persistence and grounded in psychological factors. Despite this evolution, literature reviews indicate a significant gap: the scarcity of studies that propose, implement, and evaluate concrete institutional actions to reduce dropout and promote persistence (e.g., Palharini, 2004; Garcia & Gomes, 2022; Barroso et al., 2022; Franco et al., 2022; Carniel & Espinosa, 2024). Most studies are limited to offering recommendations without empirical evidence regarding the implementation and long-term impact of these strategies. This points to an urgent need for future research to move beyond diagnosis, focusing on the systematic evaluation of interventions aimed at ensuring student success.

Methodology

This study, approved by the Research Ethics Committee of the Federal University of Rio Grande (CAAE: 50391921.4.0000.5324), was conducted at the Santo Antônio da Patrulha campus of the Federal University of Rio Grande (FURG). The participants were students enrolled in the Exact Sciences Teacher Education Program (LCE – *Licenciatura em Ciências Exatas* in portuguese)[2], with specializations in Physics, Chemistry, or Mathematics. Participation was voluntary, and the identity of all participants was kept confidential.

To achieve the objectives of this study, we administered a questionnaire adapted from Moraes (2020). The questionnaire included items regarding students' socioeconomic conditions, their experiences as program participants, and statements addressing quality of choice, goal of program completion, commitment to FURG, identification with program, persistence intention, self-efficacy, sense of belonging, and perceived curricular relevance. The last three dimensions are among those that directly influence students' motivation to persist in their undergraduate studies, according to Tinto (2017).

The questionnaire was made available online between September 2021 and February 2022, yielding 37 responses from a total of 64 students. Although this was a convenience sample, it represents approximately 58% of the total student population in the program during that period, providing significant representativeness for understanding the phenomenon in the local context under study. In this article, we analyzed the mean scores for each of the predictors of student persistence (self-efficacy, sense of belonging, perceived curricular relevance, and persistence intention) and subsequently explored motivations based on the remaining responses in the questionnaire. The other items addressed students' socioeconomic conditions, motivations for enrolling in the program, social and academic experiences, aspects of academic life that caused dissatisfaction, and participation in research, teaching, or extension activities.

Of these 37 undergraduates, 15 were in the Mathematics track (10 women and 5 men), 11 in Chemistry (8 women and 3 men), and 11 in Physics (4 women and 7 men). Ages ranged from 20 to 49 years, with a mean of 29 years and a standard deviation of 8.2. Additionally, (i) 26 were single, nine were married or in a stable union, and two selected "other"; (ii) 17 lived with parents and/or siblings, six lived alone, 12 lived with their own family (spouse and children), and two selected "other"; (iii) six reported a family income of up to one minimum wage, 16 between one and two minimum wages, 11 between two and four minimum wages, three between four and six minimum wages, and one reported an income above eight minimum wages; (iv) 11 did not contribute to the family income, two contributed 75–99%, three contributed 50–74%, seven contributed 25–49%, ten contributed 1–24%, and four were fully responsible for 100% of the family income; (v) 14 students reported that their mother had incomplete elementary education, while four

2 At the time of the research, the LCE offered daytime classes and had an annual intake through the Unified Selection System (SiSU).

indicated that she held a postgraduate degree; (vi) only one student reported that their father had no formal education, three were unable to provide information, and only one indicated that their father held a postgraduate degree; (vii) 12 were the first in their family to enter higher education, 15 had previously dropped out of a course, and four already held a university degree.

The questionnaire used as a basis for this study underwent content validation by four researchers from the Graduate Program in Physics Education at the Federal University of Rio Grande do Sul — UFRGS (Moraes, 2020). However, due to modifications in the questionnaire as well as a change in the application context, it underwent a new content validation conducted by three researchers from the Graduate Program in Exact Sciences Education at FURG and a pilot application with one student. In one of the questionnaire items, the following were constructed: (i) six statements to measure respondents' self-efficacy beliefs, (ii) six to assess sense of belonging, (iii) five to analyze perceived curricular relevance, (iv) three to identify participants' self-reported persistence intention, (v) two to examine quality of choice, (vi) three to analyze commitment to the institution, and (vii) three to assess identification with the program.

Based on the responses to these items, we conducted a reliability analysis for each measured construct using McDonald's omega (ω). The ω coefficient is a measure of internal consistency that estimates the proportion of variance in test scores attributable to a common general factor (Navarro & Foxcroft, 2025). We chose to use ω instead of the traditional Cronbach's alpha because ω does not assume that all items contribute equally to the construct (tau-equivalence), providing a more robust estimate of reliability. For this study, a value of $\omega > 0.70$ was adopted as indicative of satisfactory reliability (Navarro & Foxcroft, 2025). The McDonald's omega analysis allowed us to identify items with insufficient internal consistency, leading to their exclusion from the study (specifically, items related to commitment to the institution were excluded, $\omega = 0.6$). Only participant responses to the items highlighted in Figure 2 were retained.

Figure 2

Statements Used to Measure the Investigated Constructs[3]

Constructs (ω)	Items
Self-Efficacy (0.86)	a) I feel capable of learning concepts and theories related to the teaching of Physics, Chemistry, or Mathematics, necessary to meet the demands of the LCE program. f) I feel capable of learning the Mathematics concepts and theories necessary to meet the demands of the LCE program. l) I feel capable of learning the Chemistry concepts and theories necessary to meet the demands of the LCE program. p) I feel capable of learning the Physics concepts and theories necessary to meet the demands of the LCE program. r) I feel capable of successfully completing the evaluative activities of the courses throughout the LCE program. w) I feel capable of applying concepts and theories learned during the program to fulfill the requirements necessary to graduate from the LCE program.
Sense of Belonging (0.79)	b) Sometimes I feel that I do not belong to the FURG campus.* g) When I am on the FURG campus, I sometimes feel like a "fish out of water." m) I see myself as an integral part of the LCE student community. s) I feel that my classmates value my presence/participation in everyday activities (e.g., having lunch, casual conversations) on campus. x) Sometimes I feel that my presence does not make a difference to my classmates.* ab) I can rely on my classmates to handle the academic demands of the LCE program.
Perceived Curricular Relevance (0.70)	c) I feel that LCE instructors do not consider my learning in their classes to be very important.* h) The courses in the LCE program are of good quality. n) The courses in the LCE program are not worthy of my dedication and effort.* t) I feel that my learning throughout the LCE program will be important for my professional life. y) The content covered in the courses throughout the LCE program is important.
Persistence Intention (0.83)	e) I intend to graduate in the LCE program (Physics, Chemistry, or Mathematics). q) I have seriously considered withdrawing from the LCE program.* ac) I am fully determined to continue in the LCE program.
Quality of Choice (0.71)	o) I was well-informed about the program when I chose to enroll in the Exact Sciences Teacher Education Program. aa) My decision to enroll in the LCE program was not well thought out or planned.
Program Identification (0.72)	j) I intend to complete my undergraduate studies at FURG. u) If I change programs, I would like to continue studying at FURG. d) I am proud to study at FURG.

Source: Data obtained from the survey.

3 Items marked with an asterisk were reverse-coded for the construct analyses.

It should be noted that, during the questionnaire administration, the order of the statements was randomized; that is, they were not presented as in Figure 2, organized by the measured construct. For data analysis, we first calculated each participant's score for each construct. The score was defined as the arithmetic mean of the Likert-scale responses for the items comprising each dimension (reversing the values of negatively worded items when necessary). Before conducting the correlation analysis, we assessed the normality of the data distribution using the Shapiro-Wilk test. This test evaluates the null hypothesis that the sample comes from a population with a normal distribution (Navarro & Foxcroft, 2025). The test indicated that the data did not approximate a normal distribution ($p < 0.05$). Given this violation of the normality assumption, we opted to use Spearman's correlation (a non-parametric test).

We then conducted a descriptive analysis, considering the means and standard deviations of each construct, and examined Spearman's correlation coefficient (ρ) between the measurements. Spearman's coefficient is a non-parametric statistical measure that assesses the strength and direction of a monotonic relationship between two ranked variables. Values from 0.20 to 0.40 were considered weak correlations, and values from 0.40 to 0.70 were considered moderate (Navarro & Foxcroft, 2025). We calculated ρ between participants' self-reported persistence intention and the predictor constructs proposed in Tinto's model (2017), as well as the other measured constructs (quality of choice and program identification).

Multivariate inferential models (such as multiple regression or structural equation modeling) were not conducted, as the sample ($N = 37$) did not meet the minimum recommended size (100 to 150 cases) nor the required observation-to-parameter ratios indicated in the literature to ensure mathematical convergence and statistical power for these techniques (Kline, 2016; Hair et al., 2019). This parametric limitation justifies the choice of a mixed-methods analytical approach, using the qualitative phase to explore more deeply the interactions between variables.

In a qualitative analysis phase, based on the prior quantitative measures, we sought to understand atypical cases: for example, students whose high levels of self-efficacy, sense of belonging, or perceived curricular relevance did not translate into a strong persistence intention, as well as the motivations of those with low predictor scores. To this end, we analyzed individually the responses to multiple-choice and open-ended questions, focusing on an in-depth examination of seven specific contrasting cases. To ensure the validity and reliability of our inferences, the analysis underwent author triangulation: the initial coding of responses was discussed in pairs until consensus was reached, mitigating interpretative biases. From this verification process, four final themes emerged that guided the discussion of the results: (i) socioeconomic and structural vulnerability; (ii) academic and social (dis)integration; (iii) academic history and workload; and (iv) curricular alignment and institutional support network.

Additionally, we examined cases of students who, at some point after completing the questionnaire, withdrew from the program. These students were identified through consultation with the program coordination in the 2022/1 semester. They had positive

self-efficacy beliefs, a strong sense of belonging, and a positive perception of the curriculum. These cases are also interpreted in light of Tinto's Student Persistence Model (2017), highlighting aspects beyond the predictor constructs of persistence/attrition that may be related to their personal goals and other factors.

Results and Discussion

Through the analysis of the items and other aspects of the survey, it was possible to identify the relationships between self-efficacy beliefs, sense of belonging, and perceived curricular relevance with the persistence intention of students enrolled in the Exact Sciences Teacher Education Program at the Federal University of Rio Grande.

Through descriptive statistical analyses, we calculated the mean and standard deviation for each construct, both considering all students collectively and individually, for each student and construct. We also examined the correlations between these constructs and persistence intention.

Table 1 presents the arithmetic means and standard deviations of the responses to the 37 items for each construct and for persistence intention. The standard deviations indicate moderate variability in the data, suggesting that these constructs may differentiate students with respect to their persistence intention in the program.

Table 1

Mean and Standard Deviation of the Measured Constructs

	Self-Efficacy	Sense of Belonging	Perceived Curricular Relevance	Persistence Intention	Quality of Choice	Program Identification
Mean	7.90	6.46	7.82	8.11	6.65	8.41
Standard Deviation	1.60	1.80	1.34	2.02	2.60	1.48

When comparing these results with a study conducted with 168 undergraduate Physics students at UFRGS (Espinosa et al., 2023), we observed that the sense of belonging (6.50) and self-efficacy (7.99) were relatively similar, while perceived curricular relevance showed a lower value (8.77) and persistence intention showed a higher value (7.59). Regarding the standard deviation, our results presented lower values than those reported in Espinosa et al. (2023).

The results in Table 2 show that the three student persistence constructs proposed by Tinto (2017) are positively correlated with measured persistence intention among enrolled students, indicating that these variables are directly related: the higher the values of the constructs, the greater the persistence intention, and vice versa. Self-efficacy is moderately correlated with perceived curricular relevance and quality of choice, and weakly correlated with sense of belonging, persistence intention, and program identification. Perceived curricular relevance is moderately correlated with

sense of belonging and weakly correlated with persistence intention, quality of choice, and program identification. Sense of belonging is moderately correlated with persistence intention and weakly correlated with program identification. Program identification is moderately correlated with persistence intention and quality of choice. Finally, quality of choice is weakly correlated with persistence intention.

Table 2

Spearman Correlation Matrix among the Constructs: Self-Efficacy, Perceived Curricular Relevance, Sense of Belonging, Persistence Intention, Quality of Choice, and Program Identification[4]

Constructs Correlation Matrix		a	b	c	d	e	f
a) Self-Efficacy	rho	-					
	p	-					
b) Perceived Curricular Relevance	rho	0.406*	-				
	p	0.013	-				
c) Sense of Belonging	rho	0.350*	0.486**	-			
	p	0.034	0.002	-			
d) Persistence Intention	rho	0.385*	0.371*	0.403**	-		
	p	0.019	0.024	0.013	-		
e) Quality of Choice	rho	0.420**	0.313	0.224	0.335*	-	
	p	0.010	0.059	0.183	0.043	-	
f) Program Identification	rho	0.357*	0.366*	0.316	0.464**	0.453**	-
	p	0.030	0.026	0.057	0.004	0.005	-

In the context of the study conducted with undergraduate Physics teacher education students at UFRGS (Espinosa et al., 2023), the authors analyzed Spearman's correlations and found that self-efficacy beliefs were also moderately related to perceived curricular relevance, sense of belonging, and persistence intention. In our study, however, the former two constructs were weakly correlated with self-efficacy. In addition to this study, Franco et al. (2024) investigated the same constructs in a sample of 140 Physics students (both bachelor's and teacher education programs) from public and community universities. Their study also included self-regulated learning, self-efficacy for self-regulation, and self-efficacy for learning Physics. The results indicated that persistence intention was weakly correlated with perceived curricular relevance and self-efficacy (considering the three types measured) but moderately correlated with sense of belonging. Sense of belonging, in turn, was weakly correlated with perceived curricular relevance. All correlations found in that study were positive. In the study by Beatson et al. (2024), when examining the correlations among motivation, self-efficacy, sense of belonging, and perceived curricular relevance across two administrations with the same population and context, the authors found that motivation was weakly

4 An asterisk (*) indicates statistically significant correlations at $p < 0.05$, and two asterisks (**) indicate significance at $p < 0.01$.

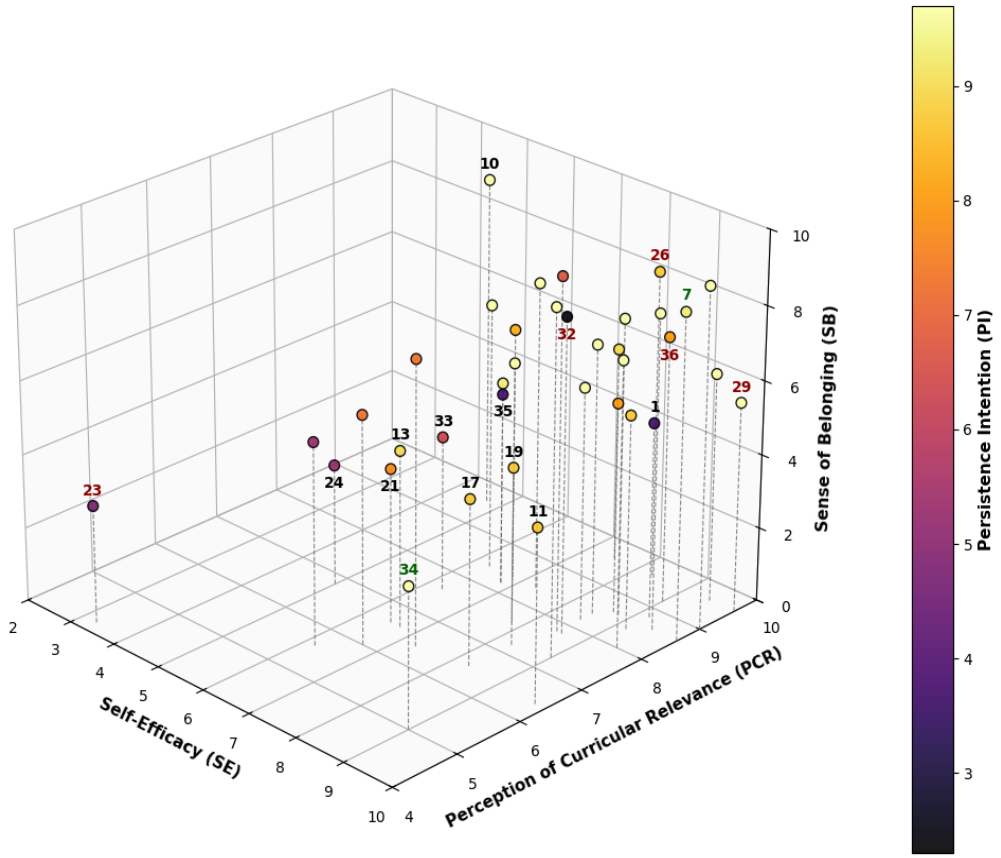
correlated with sense of belonging (r = 0.287), self-efficacy (r = 0.272), and perceived curricular relevance (r = 0.202) in the first administration, and moderately correlated (r = 0.434) with self-efficacy in the second administration.

The study conducted by Moraes (2020) evaluated the same constructs examined by Espinosa et al. (2023) but considered variations between the beginning and the end of the semester among undergraduate Physics teacher education students at UFRGS. In addition, the study analyzed correlations among program identification, quality of choice, goal of program completion, and institutional commitment using Spearman's correlation. Persistence intention was strongly correlated with program identification and with the goal of completing the program and moderately correlated with commitment to UFRGS. The only other statistically significant correlation was the moderate relationship between self-efficacy beliefs and perceived curricular relevance, which was also observed in our study.

The following graph presents, in grouped form, the mean scores for self-efficacy, sense of belonging, perceived curricular relevance, and persistence intention for each undergraduate student (Figure 3).

Figure 3

Mean Scores of Self-Efficacy, Sense of Belonging, and Perceived Curricular Relevance in Relation to Persistence Intention among LCE Students



Source: Data obtained from the study.

Each point in the graph represents an undergraduate student, and the number (label) next to each point corresponds to their identification[5]. For example, point 23 represents a student with a self-efficacy score of 3.3, perceived curricular relevance of 4.2, sense of belonging of 3.2, and persistence intention of 4.7 (represented by the color scale applied to each point). This visualization allowed us to identify which students exhibited high or low values for the constructs analyzed[6]. Based on this, we highlight some examples of students for whom factors contributing to low persistence intention and/or low self-efficacy, sense of belonging, or perceived curricular relevance were identified. This type of analysis helps inform and discuss strategic actions that could enhance student motivation in the Exact Sciences Teacher Education Program at the Federal University of Rio Grande, as well as in other programs facing similarly high dropout rates in comparable contexts. Furthermore, in subsequent consultation with the LCE coordination, we verified that some enrolled students had changed their status, becoming either graduates or dropouts. This allowed us to analyze and infer whether the predictive constructs of persistence pointed toward program completion or student attrition.

Nine LCE students (11, 13, 17, 19, 21, 23, 24, 33, 34) exhibited scores below five for *sense of belonging*, making it the predictor construct with the highest number of critical values in relation to persistence/attrition. To better understand this dynamic, we conducted a detailed analysis of *student 11* (Mathematics emphasis), who demonstrated a low sense of belonging (4.7) characterized by a complex and contradictory profile.

Initially, socioeconomic and historical factors appear to exert a strong influence on the trajectory of student 11. Her significant contribution to the family income (between 50% and 74%) and the difficulties reported in studying at home create additional stress, hindering her dedication to academic life. Furthermore, she reported having dropped out of a previous program prior to the LCE, an experience that may have generated insecurity and negatively impacted the initial formation of connections with the new institution.

In the academic domain, despite presenting a relatively high score for perceived curricular relevance (6.4), student 11 highlighted the absence of courses addressing sexuality, gender, and sexual education. As she considers these topics fundamental to her formation, this gap may have contributed to a sense of detachment from the program. This distancing is also reflected in her interpersonal relationships: although she actively participates in various academic extracurricular activities (extension projects, scientific initiation, the Institutional Teaching Initiation Scholarship Program — PIBID, and the Student Central Directory — DCE) as well as non-academic activities (conversations with peers, campus parties, and cultural events), she reported feeling that her presence is not valued by her peers.

5 The labels for students 1, 7, 10, 11, 13, 17, 19, 23, 24, 26, 29, 33, and 34 are located just above the data point, while for students 21, 32, 35, and 36, they are located just below.

6 We adopted a value of five as the cutoff for selecting the cases examined qualitatively: any construct with a mean below five was considered critical (warranting further analysis). In the individual descriptions, the terms 'high,' 'moderate,' and 'low' are used descriptively, relative to the 0–10 scale, and are not restricted to this threshold.

Despite socioeconomic difficulties and the feeling of not being valued by her peers, we identified crucial factors that support her persistence. The psychological support provided by the Office of Student Affairs, her engagement in various institutional projects, and the high importance she attributes to obtaining her undergraduate degree appear to have been essential for her retention. In sum, the case of student 11 illustrates how a high level of institutional involvement and pursuit of support can coexist with a low sense of belonging, highlighting the need for a multifactorial perspective on the student experience.

This scenario corroborates the findings of Ribeiro et al. (2025), who, when mapping profiles of STEM students in southern Brazil, identified the group of "underrepresented" students. Like student 11, individuals in this profile often come from historically disadvantaged backgrounds and report the lowest levels of sense of belonging, reflecting structural barriers to social integration. Nevertheless, persistence is often driven by a high perception of curricular relevance, with the degree seen as an essential pathway for upward mobility.

Like student 11, *student 24* (Physics emphasis) also exhibits a low sense of belonging (3.3), relatively low persistence intention (5.5), and self-efficacy (5.0). Several factors may have influenced his sense of belonging, including his perception that professors demonstrate low empathy, difficulties in participating in extracurricular activities, and the perceived lack of student involvement in the curricular organization of the course. More specifically, student 24 reported feeling a lack of awareness from professors regarding the students' context, particularly due to challenges in commuting from his residence to the university. Additionally, he mentioned difficulties in engaging in both academic and non-academic extracurricular activities due to limited access to scholarships and constrained time. Although he reported a positive perception of curricular relevance (6.8), student 24 expressed dissatisfaction with the absence of courses aligned with his interests and emphasized concerns about the need for better coordination among professors to connect disciplines and ensure broader participation of the academic community in shaping the course curriculum.

Thus, in the specific case of student 24, we observe that his motivation to continue in the course is closely related to his interest in Physics and his desire to pursue a professional career (a sub-construct associated with the perception of curricular relevance), as he expressed the intention to obtain his degree in order to work as a teacher. This indicates that he has a clear professional goal that encourages him to persist despite the challenges he faces. Supporting this, students' goals and institutional commitment in higher education have been shown to be associated with student retention and attrition (Chrysikos et al., 2017). Accordingly, as proposed by Tinto's model (2017), his course-completion goals have been essential to his persistence in the LCE program.

Regarding strategies to foster a sense of belonging, Tinto (2022) suggests the creation of learning communities, particularly for first-year students, so that learners can extend their engagement beyond the classroom, crossing academic and social

boundaries through a supportive network that helps them manage challenges, especially during the first year. However, it is also necessary to consider students who engage in other concurrent activities alongside their undergraduate studies, such as students 10, 33, and 36. For these students, promoting a sense of belonging should occur primarily within the classroom and laboratory settings, through actions led by the instructor.

Regarding the *perception of curricular relevance*, only one student (student 23) rated this dimension below 5.0, while another student (student 34) scored exactly 5.0. Additionally, 21 participants rated this dimension above 8.0.

Regarding *student 23* (Chemistry emphasis), in addition to presenting a low perception of curricular relevance (4.2), as shown in Figure 3, she was also the only one to display low scores across all measured constructs (SE = 3.3; SB = 3.2; PI = 4.7; QC = 3.5; Program Identification = 4.3). Analyzing her responses, we identified several factors that may have negatively affected her beliefs in relation to these constructs. Concerning her low perception of curricular relevance, the student mentioned that her perceived ease with exact sciences, identified by herself during high school, proved insufficient for the demands of the undergraduate program. This perceived disconnect between secondary and higher education may have contributed to a decreased sense of curricular relevance. The transition from high school to higher education is frequently discussed in the literature (e.g., Pinho et al., 2015; Dias et al., 2019). In Pinho et al. (2015), which involved interviews with eight students from different courses, the following factors were mapped as related to this transition: infrastructure; access to information about the university and the course (lack of access, first-year student orientation, coordination with faculty and senior students); external factors (e.g., deficiencies in prior high school preparation); organizational aspects (course structure, bureaucracy, lack of instructors and academic boards); study materials (insufficient or hard-to-access collections and high volume of content); relationships and interaction with faculty; personal aspects (e.g., maturity, changing perceptions); personal organization for study (increased dedication, better performance, feeling discouraged, time management); and physical or psychological symptoms (e.g., fatigue).

Regarding self-efficacy, student 23 presented three main factors: difficulty dealing with higher education content, the perception of study overload without satisfactory results, and issues related to interactions with faculty. More specifically, despite having an aptitude for exact science subjects in secondary school, the student faced significant challenges upon entering the undergraduate program. All of these factors were described by Pinho et al. (2015) as related to the transition to higher education. In this case, we also identified that this transition may have undermined her confidence in her ability to learn and overcome academic challenges (related to self-efficacy). The perception of overload may be linked to her report of having devoted herself intensely to studying, including attending private classes, yet still feeling that her efforts were insufficient. This sense of overload could have generated feelings of inadequacy, consequently reducing her self-efficacy. In other words, the difficulties reported by student 23 related to the transition to higher education not only negatively affected her perceived curricular relevance but also likely contributed to her low self-efficacy beliefs.

Moreover, the combination of her issues with faculty, difficulty adapting to higher education, and lack of identification with the institution may have contributed to student 23's low sense of belonging. However, one factor that could have supported a positive sense of belonging was her participation in projects such as Pibid, the Pedagogical Residency, extension programs, and the FURG Academic Athletic Association. Despite this engagement, her scores were low across all constructs, including her intention to persist, which, together with other factors she reported, led to her leaving the LCE program in the 2021/2 term.

In the case of student 23, considering her difficulties related to faculty, a sense of pedagogical care could have improved both her self-efficacy and sense of belonging. In the results reported by Heidemann et al. (2020), pedagogical care was considered fundamental by first-year Physics students at UFRGS participating in the Introduction to Physics course. In class, students perceived that the course instructor demonstrated genuine concern for their learning. Furthermore, beyond teachers' concern for students, the importance of frequent feedback was emphasized (Vázquez-Alonso & Manassero-Mas, 2016). Regarding feedback, Tinto (2012) highlights it as one of the main dimensions for student academic success. In environments rich in evaluations and feedback, students and teachers are more likely to adjust their behaviors to achieve satisfactory outcomes. This process provides critical information about student difficulties and the effectiveness of teaching practices, guiding possible interventions and offering early warning indicators of student conditions, thereby enabling proactive measures to prevent dropout (Tinto, 2012).

Regarding *self-efficacy*, only students 10 and 23 scored below 5.0, one student (24) scored 5.0, while 19 students scored above 8.0. *Student 10* (Mathematics emphasis) reported low self-efficacy (4.7) but scored highly on the other constructs (SB = 9.0; PCR = 9.6; PI = 9.7; QC = 7; Program Identification = 9.7). Although she reported initial difficulties with the course, her participation in teacher training programs (Pibid and Pedagogical Residency), combined with the responsibility of being the primary provider for her family, seems to have been fundamental to her persistence.

As supported in the literature, a strong identification with the profession (teaching), shaped by intrinsic motivation, supportive environments, and mentorship (Carvalho, 2007; Ponomarenko et al., 2024), significantly promotes the persistence of students and interns in their courses and future careers (Weiss et al., 2023). Fostering professional identity from the outset and consistently is essential to reduce dropout rates and ensure long-term commitment. Thus, for this student 10, the combination of her identification with teaching and the need to secure her professional future may have strengthened her belief in her ability to overcome academic challenges. However, the initial difficulty of the course may have impacted on her academic self-efficacy.

As mentioned previously, thanks to updates provided by the course coordination, we were able to identify which students graduated or dropped out after responding to the questionnaire. Thus, we discuss the cases of students who, according to Tinto's (2017)

Student Persistence Motivation Model, showed signs of success but ultimately dropped out of the course. We also consider those whose predictors of dropout/persistence were compromised yet still managed to complete the LCE program.

Students 26, 29, and 36, despite having high average scores for self-efficacy, sense of belonging, perception of curricular relevance, and persistence intention, ultimately dropped out of the LCE program. The decision of *student 26* (Physics emphasis) to leave the course may have been influenced by a combination of factors, including socioeconomic conditions, a history of prior dropout, and low academic engagement. Although his choice of course was based on affinity with the field and the proximity of the institution, we identified structural vulnerabilities that were decisive: the student reported not having an adequate study environment at home and having a previous history of dropout in higher education. The lack of suitable home conditions is a factor that negatively affects academic performance (Komlavathi & Yasin, 2022), which, combined with prior dropout, suggests potential difficulties in adapting to academic life and maintaining the persistence necessary for completion. Furthermore, student 26 reported not participating in academic extracurricular activities (research, teaching, and extension) or non-academic activities (conversations, parties, social groups, etc.), indicating lower engagement with the academic community (Tinto, 2012). Finally, the lack of more detailed information in this students' responses hindered a deeper analysis of the reasons behind the dropout.

Student 29 (Chemistry emphasis) already held a bachelor's degree in the field and is currently pursuing a PhD in the same area. The overload of activities and the need to prioritize other responsibilities—a central challenge for participation and persistence in higher education—may have contributed to her decision to leave the licentiate program, despite her strong performance on the measured constructs. The combination of doctoral demands with those of the licentiate likely resulted in an excessive workload, a scenario common among students with multiple responsibilities, which can lead to stress and conflicting priorities (Lowe & Gayle, 2007). In addition, the need for financial support and the focus on completing her PhD may have led the student to prioritize these activities over the licentiate program, resulting in non-participation in extracurricular activities. Overall, student 29 did not report clear reasons for her dropout (which occurred in 2022/1), as she had high scores across all constructs.

The incompatibility between work and studies, combined with the lack of flexibility in the program, seems to have been decisive for the dropout of *student 36* (Physics emphasis). His eight-hour workday likely made it unfeasible to reconcile employment with academic responsibilities, which can generate stress due to conflicting priorities (Lowe & Gayle, 2007), especially in the absence of evening classes or distance learning options. The lack of participation in both academic and non-academic extracurricular activities also suggests lower engagement with the academic community. Like students 26 and 29, student 36 reported not participating in any of these activities in the LCE, which may reflect difficulties in integrating into the university environment. Scheduling conflicts during the 2022/1 semester appear to have been the main factor that led to his course abandonment.

The situation faced by these students directly aligns with the profile of "workers" described by Ribeiro et al. (2025), characterized by students who need to balance employment with their undergraduate studies and who consequently experience a drastic reduction in opportunities for social and academic interaction on campus. Although persistence intention in this group may be high due to professional motivations, the lack of institutional flexibility in the face of this workload increases the risk of dropout, highlighting that social background decisively affects how university experiences are lived.

Finally, the case of *student 34* (Chemistry emphasis) illustrates the complexity of completing the LCE program, which involves multiple factors. Despite presenting a low sense of belonging (3.8) and a moderate perception of curricular relevance (5.0), the student was able to complete the course. His high self-efficacy (9.0), combined with financial support, engagement in academic extracurricular activities, and external motivations, was decisive for his persistence. The belief in his ability to handle academic demands was essential to overcoming challenges such as the low sense of belonging and the limited perception of curricular relevance. This self-efficacy appears to have been strengthened by his participation in research projects, tutoring, and teaching residency programs, which provided successful experiences and the development of practical skills. External factors, such as family expectations, the desire to pursue a teaching career, and the need to obtain the degree, also played an important role by offering purpose and directing his efforts. Financial support, through scholarships and aid, alleviated economic pressure, allowing him to fully dedicate himself to his studies (Tinto, 2012, 2022).

Additionally, his participation in activities such as research, extension projects, tutoring, and teaching residency contributed to the development of skills, the creation of professional networks, and the strengthening of his connection to the institution. In one study, most students reported that these activities helped them succeed (King et al., 2020). However, student 34 also faced factors that could have led to dropout, such as uncertainty about the future of the teaching profession and the perception of teacher devaluation, which generated doubts about his course choice. These challenges highlight the importance of providing personalized support, promoting a stronger sense of belonging, and reinforcing students' perception of curricular relevance. In the case of this student (34), as also observed in the study by Pigosso et al. (2020), even if a student presents one or more low values among the predictors of dropout/persistence, it is possible that "the perceived extrinsic benefits of earning a college degree are sufficiently great to require completion" (Tinto, 2017, p. 6).

In summary, the results show that although constructs such as self-efficacy, sense of belonging, and perception of curricular relevance are positively correlated with the persistence intention of students in the Exact Sciences Teacher Education Program, the individual academic trajectory is significantly more complex and multifaceted. Case analyses reveal that high persistence indicators do not guarantee retention, as

seen in students who dropped out due to external factors such as workload, conflicts with employment, or socioeconomic challenges. Conversely, students with unfavorable predictors, such as a low sense of belonging, were able to complete the course supported by high self-efficacy, financial aid, clear external motivations, and engagement in extracurricular activities. Therefore, student retention is not determined by a single factor but by a complex interaction among students' beliefs, their academic and social engagement, and the contextual conditions of their lives, reinforcing the need for personalized institutional interventions that promote pedagogical support and a sense of community beyond quantitative metrics.

Final Considerations and Implications

The statistical analysis revealed that self-efficacy, sense of belonging, and perception of curricular relevance are positively correlated with students' intention to persist. This indicates that higher values in these constructs are associated with a greater likelihood of students wanting to remain in the program. Specifically, self-efficacy showed a moderate correlation with both perception of curricular relevance and quality of choice. Perception of curricular relevance, in turn, is moderately correlated with sense of belonging, which is moderately correlated with intention to persist. Additionally, identification with the program exhibited a moderate correlation with both persistence intention and quality of choice. Among the predictor constructs, the sense of belonging presented the highest number of critical scores; nine students recorded values below five for this dimension. Furthermore, the qualitative analysis revealed specific gaps in the curricular structure of the program, even though the perception of curricular relevance was positively assessed by most students. Students pointed to the absence of courses they considered important for their education and expressed the need for greater articulation between courses, as well as for the academic community's participation in curriculum design. These accounts suggest a need for curricular restructuring of the program, which was implemented after the conclusion of this study at the beginning of 2023. To determine whether this change has improved students' perception of curricular relevance, further research will be necessary.

We also conducted individual analyses of some enrolled students, considering the descriptors for attrition proposed by Vincent Tinto (self-efficacy, sense of belonging, and perception of curricular relevance) in relation to their intention to persist. This approach allowed for a deeper understanding of each case and helped identify the reasons behind students' persistence or withdrawal. The qualitative analysis of individual cases, however, revealed both limitations and necessary adaptations of Tinto's (2017) model for the Brazilian context and for an off-campus site. This stage, organized around four themes—socioeconomic and structural vulnerability; academic and social (dis) integration; academic history and workload; and curricular alignment and institutional support network—made it possible to interpret trajectories that the quantitative score alone would not explain. This is illustrated by the cases of students 26, 29, and 36,

who withdrew from the Exact Sciences Teacher Education Program (LCE) program despite exhibiting high average scores in self-efficacy, sense of belonging, perception of curricular relevance, and persistence intention.

External factors were decisive in student dropout, such as socioeconomic difficulties, the need to balance undergraduate studies with other demanding activities (such as a doctoral program or an eight-hour workday), and low engagement in extracurricular activities. The opposite was also true, as in the case of student 34, who managed to complete the course despite having a low sense of belonging (3.8) and only a moderate perception of curricular relevance (5.0). For him, high self-efficacy (9.0), combined with financial support through scholarships, engagement in academic activities such as research and teaching residency, and external motivations such as the desire to pursue a teaching career, were key factors for his persistence. The analysis of student 23, who dropped out, reinforces the importance of these factors, as her low scores across all constructs were linked to difficulties in the transition from high school to higher education, a sense of overload, and problematic interactions with faculty.

Additionally, this study stands out by focusing on an off-site campus, a context with characteristics distinct from universities in major urban centers, which are more frequently studied. Challenges such as commuting and the need for many students to work limit the time they spend on campus and, consequently, their participation in extracurricular activities that strengthen their sense of belonging. Given this reality, and considering that sense of belonging was the most fragile construct among the participants, a fundamental action for the Federal University of Rio Grande, Santo Antônio da Patrulha campus—perhaps even more critical than in central campuses—is the promotion of a sense of belonging within classrooms and laboratories. This underscores the importance of the professor's role, whose pedagogical attention and provision of constant feedback become essential tools not only for fostering self-efficacy but also as a primary factor in creating a welcoming and integrative environment for students with limited available time.

Therefore, we conclude that the decision to persist is a multifactorial phenomenon, influenced by a complex web of psychological, social, and, crucially, contextual factors. For higher education institutions, especially in off-site campuses, promoting student retention requires strategic actions that acknowledge these particularities, going beyond general metrics and fostering a supportive environment focused on the classroom, strengthening the teacher-student relationship, and valuing each student's individual goals.

Authors' Contribution

Conceptualization: Carniel, L., Espinosa, T.; **Data curation:** Carniel, L.; **Formal analysis:** Carniel, L., Espinosa, T.; **Investigation:** Carniel, L.; **Methodology:** Carniel, L., Espinosa, T.; **Project administration:** Carniel, L., Espinosa, T.; **Resources:** Carniel, L.; **Supervision:** Espinosa, T.; **Validation:** Espinosa, T.; **Visualization:** Espinosa, T.;

Writing – original draft: Carniel, L.; **Writing – review & editing:** Espinosa, T.

Data Availability Statement

The data will be provided upon request.

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