

The perspective of enrolled undergraduate students on the dropout in a Physics Teaching Degree^{1 2 3 4}

A visão de matriculados sobre a evasão num curso de Licenciatura em Física

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Abstract

We aim to understand what are, in the perspective of undergraduate students in Physics Teaching degree, the causes and possible solutions to combat the dropout rate of the course. For this, we were grounded on the theoretical model of Tinto and literatur considerations on the causes and the possible action strategies against dropout in Higher Education. Thirty-three students participated in the research by answering an open-answer questionnaire. The analyses, done through Content Analysis, indicated that most participants had already thought about dropping out, especially those who entered without or with reduced levels of commitment to the course. Learning difficulties and a greater sensitivity of the teachers and the institution towards them were pointed, respectively, as the main reason for dropping out and the best way to combat it.

Keywords: School dropout, Initial Teacher Training, Physics, Enrolled student, Higher Education

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³ Funding: Programa Institucional de Bolsas de Iniciação Científica e Tecnológica do Instituto Federal de Educação Ciência e Tecnologia de São Paulo (PIBIFSP)

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Resumo

Objetivamos compreender quais são, na visão de licenciandos em Física, as causas e as possíveis soluções para a evasão no curso. Para isso, tomamos como base o modelo teórico de Tinto e considerações da literatura sobre as causas e as possíveis estratégias de ação contra a evasão no Ensino Superior. As informações de pesquisa foram coletadas junto a 33 estudantes por meio de um questionário dissertativo. As análises, realizadas por meio da Análise de Conteúdo, indicaram que a maioria dos participantes já havia pensado em evadir, especialmente aqueles que ingressaram sem ou com níveis reduzidos de compromisso com o curso. As dificuldades de aprendizagem e uma maior sensibilidade dos docentes e da instituição em relação a elas foram apontadas, respectivamente, como o principal motivo para a evasão no curso e a melhor maneira de combatê-la.

Palavras-chave: *Evasão escolar, Curso de Licenciatura, Física, Aluno matriculado, Ensino Superior*

Introduction

Student dropout implies social losses because professionals are not trained; academic because it leaves an empty place; and economic considering that the financial investments done by the student and/or society did not have the expected result. In the case of public institutions, this waste would negatively impact its cost-benefit to the city/state/country and societal perspective on its operation (Davok & Bernard, 2016; Lima Junior et al., 2012; Massi & Villani, 2015; Silva Filho et al., 2007).

Though it would be necessary to consider the complexity of dropout and the sociocultural and economic particularities of each nation and educational institution, there seems to be a certain homogeneity regarding the degrees/areas of Higher Education more strongly hit by the phenomenon (Almeida & Schimiguel, 2011; Lima & Machado, 2014). Degrees in the area of Natural/Exact Sciences and the Teaching degrees have been pointed out as the most affected. In this sense, Physics Teaching degrees have high dropout rates (Davok & Bernard, 2016; Lima Junior et al., 2012; Massi & Villani, 2015).

Even if there are slightly different characterizations for the concept of dropout student, in this work we assume that this is who dropped out of the course, regardless of the reason—internal transfer (to another degree in the institution), external transfer (to another institution,

regardless of the degree), voluntary dropout, *jubilamento*⁵, or death. Based on that and considering the discussion of the previous paragraphs, we aimed to understand which are the causes and possible solutions for the dropout rate in the Physics Teaching Degree through the perspective of enrolled undergraduate students. The research questions we aim to answer during this work are: Which factors have contributed to the dropout in the course? What could be done to combat it? How do these causes and possible solutions dialogue with those mentioned by the literature in the area?

To answer these questions, in the following section we present some contributions from Vincent Tinto as theoretical-methodological support to approach the theme. We also introduce what the literature has been saying on the causes and possible solutions for dropout. After, we evidence how the information for the research was collected and analyzed. Finally, we present the results obtained and present some considerations.

Theoretical References

American researcher Vincent Tinto, currently working in Syracuse University, in the state of New York (USA), had his original training in Physics and his PhD in the area of Sociology of Education (Tinto, 2019). Though his older studies on dropout are almost 50 years, they are still used in the studies on the theme (Kussuda, 2017; Pereira Junior, 2012).

Tinto's theoretical model on Higher Education dropout considers that students' decision to dropout arises from its non-integration to social and academic systems, which would negatively impact their levels of commitment to graduate (have a higher education diploma) and with the institution (motivation to be in it). The author's inspiration arises from contributions developed by Émile Durkheim and others used in the economic area. From Durkheim, he takes the theories on suicide which indicate that the lower the level of social integration, the higher the probability for a person to commit suicide. From economics, he considers the notion of cost-benefit, associated with the result between the reasons that decrease or increase the commitment level of students to graduate and with the institution (Lima Junior, 2013; Pereira Junior, 2012; Tinto, 1987).

⁵ Translation note: *Jubilamento* is when the student has to leave the university because he/she has extrapolated the maximum duration stipulated by the institution to finish his/her degree.

Though his first model is from 1975, Tinto changed it throughout the 1980s and 1990s. The model we will use in this work- with some adaptations- was originally published in 1987. This model assumes that, when admitted in Higher Education, students bring with them their family background, the knowledge, and ability built during their lives. This background guides initial internal commitments with graduating in the institutions and personal intentions of other natures, such as making friends and meeting people from other regions of the country. Parallel to this, the student must deal with external commitments, such as work, finances, and family, which continuously influence the intentions and internal commitments (Tinto, 1987).

Higher Education institutions would be formed by two interconnected systems: the academic and the social. The academic system is related to the formal elements of the course, encompassing aspects such as classes, academic performance, and interaction with teachers/professors. The social system encompasses the other environments and situations that trespass the continuation in the course, as the interpersonal relations with peers. Similar to the external commitments, the integration of students with these systems, i.e., the academic and social integrations will continuously work on the reformulation of intentions and initial commitments. If the levels associated with them are lower than a certain standard, there will be a chance of dropout (Tinto, 1987).

There is a lack of Brazilian studies on the role of commitments proposed by Tinto associated with dropout (Pereira Junior, 2012). On the other hand, there are few references on the addition of other commitments to the model, as took place in the national context with the emergence of the notion of commitment with the course (Mercuri & Polydoro, 2003). It would be a commitment related to the preference for a degree and the safety of a future career, which would distinguish the commitment with graduation - associated with obtaining a higher education diploma (Pereira Junior, 2012).

It seems reasonable to admit that most students who joined Higher Education are interested in obtaining a diploma. The exceptions would be students admitted guided only by “personal intentions of other natures” – certainly a minority. Thus, we assume that the initial level (when admitted in Higher Education) associated with the commitment to graduate can hardly be reduced over time, differently from what can happen in the levels of commitment with the course and/or with the institution. In other words: we assume that, in general, the undergraduate that drops out does not do it because has given up to have a Higher Education diploma, but because of reasons that led him/her to drop out of a certain degree and/or institution at that moment. Therefore, in this work, we consider that dropout can take place when there is a decrease in students’ commitment levels with the course and/or institution –

we will not take into account in our analysis the possible alterations in students' commitment level to graduate.

In fact, several academic, interpersonal, and external factors can reduce the level of students' commitment with the course and/or with the institution. Based on the literature consulted about students' dropout in Undergraduate degrees, presented in tables 1 and 2, we compiled some of the main factors that contribute to its occurrence and possible ways to minimize it.

Table 1 – Causes of Higher Education dropout

Cause	Study(ies) that mention it
Accumulation of failures on the subjects of the course, especially due to learning difficulties	Mazzetto and Carneiro (2002); Braga et al. (2003); Tontini and Walter (2014); Santana (2016); Gregório et al. (2017); Kussuda (2017); Simões (2018)
Regret of course choice/career (student that changes to another undergraduate degree)	Braga et al. (1997); Mazzetto e Carneiro (2002); Machado et al. (2005); Tontini and Walter (2014); Santana (2016); Kussuda (2017)
Students' relationship problems with professors	Arruda and Ueno (2003); Daitx et al. (2016); Santana (2016); Kussuda (2017); Simões (2018)
Lack of time to dedicate to the course	Kipnis et al. (1997); Tontini and Walter (2014); Ribeiro (2015); Santana (2016); Simões (2018)
Integration problems with classmates	Daitx et al. (2016); Santana (2016); Kussuda (2017)
Deficient K-12 education (pointed out by professor or students themselves)	Braga et al. (1997); Ribeiro (2005); Kussuda (2017)
Low value/expectation towards the profession associated with the course	Tontini and Walter (2014); Ribeiro (2015); Santana (2016); Kussuda (2017)
Financial difficulties during the course	Machado et al. (2005); Ribeiro (2005); Santana (2016)
Limitations of the professors of the course (no interest for teaching, flawed didactics etc.) according to the students	Ribeiro (2005); Kussuda (2017)
Discontent with institutional infrastructure associated with the course (laboratories, equipment etc.).	Mazzetto and Carneiro (2002); Kussuda (2017)
Family issues during the course	Santana (2016); Kussuda (2017)
Students' immaturity and adaptation problems to a new phase of life	Bueno (1993); Kussuda (2017)
Lack of support and guidance in the beginning of the course	Daitx et al. 2016); Santana (2016)
Reality experienced in the course was different than the one imagined	Kussuda (2017); Santana (2016)
Students' dissatisfaction with the curriculum	Daitx et al. (2016)
Lack of dedication by some students, according to the professors.	Kussuda (2017)
Selective dedication of professor towards research activities at the expense of teaching activities	Kussuda (2017)

Source: Created by the authors based on the studies cited on the table.

Table 2 – Action strategies against dropout

Action suggested	Study(ies) that mention it
Improvement of actions related to the welcoming and follow-up of undergraduate students	Bueno (1993); Braga et al. (1997); Kipnis et al. (1997); Cunha et al. (2001); Braga et al. (2003); Machado et al. (2005); Ribeiro (2005); Daitx et al. (2016)
Reformulation of the curriculum	Bueno (1993); Braga et al. (1997); Cunha et al. (2001); Mazzetto e Carneiro (2002); Braga et al. (2003); Tontini e Walter (2014); Daitx et al. (2016)
Improvement of the didactic-pedagogical aspects of the course	Mazzetto e Carneiro (2002); Braga et al. (2003); Daitx et al. (2016)
Indication of professor that stand out as teachers for the subjects in the beginning of the course	Braga et al. (1997); Machado et al. (2005); Daitx et al. (2016)
Better management of scholarships and aids	Braga et al. (1997); Machado et al. (2005); Simões (2018)
Offering activities of tutoring	Tontini and Walter (2014); Gregório et al. (2017); Kussuda (2017)
Offering subjects of the course in times that attend students	Braga et al. (1997); Daitx et al. (2016)
Implementation of vocational, professional, and educational guidance	Bueno (1993); Machado et al. (2005)
Incentive for undergraduates to participate in projects and academic activities beyond the subjects of the course	Braga et al. (1997); Simões (2018)
Enlargement of the connections between Higher Education institutions and other societal components (companies, public authorities, schools etc.)	Bueno (1993); Tontini e Walter (2014)
Value the teaching activities of the professors	Bueno (1993)
Raise the awareness of professor on students' difficulties	Kussuda (2017)
Redefinition of the roles of students and teachers/professors	Daitx et al. (2016)
Implementation of actions that help students build previous knowledge, considered to be necessary for the course	Lima Junior (2013)
Enlargement of cultural and sociability spaces in the institution	Bueno (1993)
Institutional identification of students risking dropping out to take the necessary individualized measures	Tontini and Walter (2014)
Institutional offering of psychological and health guidance for students	Tontini and Walter (2014)

Source: Created by the authors based on the studies cited on the table.

It is worth mentioning that these lists encompass elements highlighted by several works, without considering their differences regarding the analyzed undergraduate degrees, the theoretical-methodological references they used, the data collection and analysis procedures employed, and the different understanding of what is a dropout student. We believe that this compiled information is justified considering the impossibility of any generalization regarding the causes and possible solutions for dropout, after all each Higher Education degree/institution has its own particularities. Therefore, we take Tables 1 and 2 as references that allow a general view on the dropout phenomenon and not as reliable portraits of the reality experienced in each case.

Methodology

We collected data with students enrolled in the Physics Teaching degree in a federal public institution. Currently, the degree offers 40 annual places in the morning period, admitted in the first semester. Though these places were commonly occupied, the course historically has high dropout rates – over 70%. The dropout normally happens in the first half of the four-year course, specially the two first semesters.

We used a digital questionnaire to collect data. The electronic address to access it was sent by email to the undergraduates that, at that moment, were enrolled (a bit more than 100). The electronic address to access the questionnaire was also made available in a group of the degree in a social network. The answers for the questionnaire were conditioned to the reading and acceptance of a Consent Form – a procedure compatible to the guidelines of ethics in the research (process n° 87398218.4.0000.5473 at *Plataforma Brasil*).

We now present the four questions that make up the questionnaire. We have omitted the name of the institution (substituted by the letter X) to respect the standards of blind review:

1. a) What reasons led you to enter the degree course in Physics Teaching at X?
b) Was this your desired degree or would you like to have done another?
2. Have you ever thought about dropping out? What reasons led you to that?
3. You certainly know people who have dropped out. In your opinion, what led them to that, that is, what are the causes to drop out of the Physics Teaching degree at X?

4. In your opinion, what actions should be taken to avoid/reduce students' dropout from the degree?

Based on Tinto's ideas, the first question intended to raise evidences on the initial internal level of commitment of each undergraduate student regarding the degree course and the institution. Because of this, the question does not refer only to the reasons that would had led students to enter the Physics Teaching degree course (as 'What reasons led you to enter the degree in Physics Teaching?'), but those that led them to enter in the Physics Teaching course in this specific institution. In the second question, we aimed to discover if and why enrolled students' internal commitments reached certain levels that could lead to dropout. The third question also aimed to raise these factors, but now focusing on the perspective of students enrolled on those who effectively dropped out. Finally, in the fourth question we wanted to give a voice to students, reflecting on the possibilities to deal with the problem, and, again, on the factors that have negatively impacted undergraduates' internal levels of commitment regarding the course and the institution.

When writing the project, whose results are presented in this article, we talked with some workers of the institution responsible for the Academic Records and Socio-pedagogical directories. They pointed out the difficulty to contact students who had already dropped out and to have them explain their reasons to dropout. Faced by these difficulties and considering that "by giving a voice to the student who continues, we can, indirectly, identify the possible causes that could lead to dropout and, thus, anticipate the actions that could avoid students' dropout" (Santos & Giraffa, 2016, p. 2), we have opted to collect information on dropout from enrolled students.

To analyze students' answers, we used Content Analysis that aims to describe, classify, and categorize the content from verbal and non-verbal communication, allowing us to grasp the meanings associated with them and the understandings that extrapolate those presented in common readings. To do so, we assume the impossibility of a neutral analysis and seek to consider the contexts associated with the communications analyzed and the analysis itself (Bardin, 2011; Carlomagno & Rocha, 2016; Moraes, 1999).

Content Analysis is normally structured in phases, which, depending on the author, may vary in number and terms. Despite this, the ideas seem to converge regarding the development

process of the analysis as a whole. In this work, we were based in five sequential and independent phases proposed by Moraes (1999). In the first (preparation), we coded the information raised by the attribution of fictional names to the participants, without considering their equivalence of gender. We also read the answers written by all research participants. The reading was done sequentially, according to the answers on the questionnaire, i.e.: we read all the answers of all participants for item “a” of the first question. After, all the answers for item “b” of the same question, and so on. As all questions were related to the theme of dropout, in this first section, it was not necessary to isolate excerpts of the answers, as all were relevant to the research.

In the second phase (unitarization) we defined as a unity of meaning the statements in students’ answers. From that, we have identified and isolated these units. For example: in the answer to item “a” of the first question, on the reasons that led students to join the Physics Teaching degree in the institution, one of the undergraduates wrote: “The reason was that I wanted to be a teacher, and I always did well in the area of exact sciences, then Physics. And the fact that it is a public institution”. In that answer, we identified and isolated three units of meaning: “wanted to be a teacher”; “did well in the area of exact sciences”; and “it is a public institution”. In the answer of the fourth question, on the ways to minimize the dropout problem, one of the undergraduates wrote: “Stronger interaction among students, motivational lectures, and offering other actions that make students interact and feel more as a part of the institution”. In this answer, we identified three units of meaning: “stronger interaction among students”; “motivational lectures”, and “offering other actions that make students interact and feel more as a part of the institution”.

In the third phase (categorization), we have built categories based on the grouping of similar units of meaning. The fourth (description) and fifth (interpretation) phase refer to the following section of this work. On it, we present the categories built; we evidence what type of unit of meaning was allocated in each of them; we present the percentage and the absolute numbers related to each category; and we explore the results obtained, correlating the inferences that emerged from the analysis of each question, comparing the categories with the systematizations from the academic literature on dropout, and interpreting the inferences based on the ideas of Tinto.

Finally, we explain that, as suggested by Moraes (1999), the analysis was cyclic, in multiple reading efforts, refining of categories, and explaining the meanings.

Results and Analysis

In total, 33 undergraduate students of the Physics Teaching undergraduate degree who were enrolled in the mid-2018 took part in the research (by answering the questionnaire). Among this, 28 had studied for 2 or more semesters and 5 for a semester. Thus, when they answered the questionnaire, all participants already had some ideas on the reasons for their classmates to drop out and what could have been done to avoid it.

Regarding item “a” of the first questions, on the reasons that led students to enroll in the course, we noticed that, for most students, the enrollment was due to at least one of these three factors: proximity of the institution to hometown; interest for the area/subject; interest for the teaching career.

As the answers were open, the student could mention more than one reason, i.e., a certain answer could have many units of meaning. These were grouped into seven categories, I: the interest for Physics, Natural/Exact Sciences and/or Mathematics; II: proximity of the institution to the city/place they live; III: interest for teaching/education; IV: quality/reown of the degree/institution; V: gratuity of the course; VI: possibility of personal/professional growth; VII: only possibility reached.

In the graphic of Figure 1, below, the black bar refers to one of these categories. The height of the bars refers to the percentage of mentions, calculated based on the total of 33 participants and visualized based on the left vertical axis of the graphic. Thus, a percentage of 40% for a category W indicates that in the answers of 40% of the participants we have identified unities of meaning grouped in this category W. Then, the addition of the percentages of the graphic surpass 100%, as a student could mention more than a reason for his/her answer. The grey circles, connected to the black bar of the graphic, refer to the absolute quantity (whose sum is over 33, considering that each participant could point out more than one reason). The values associated with these grey circles, i.e., the absolute number of mentions related to each of the seven categories of reasons, can be seen based on the vertical right axis of the graphic.

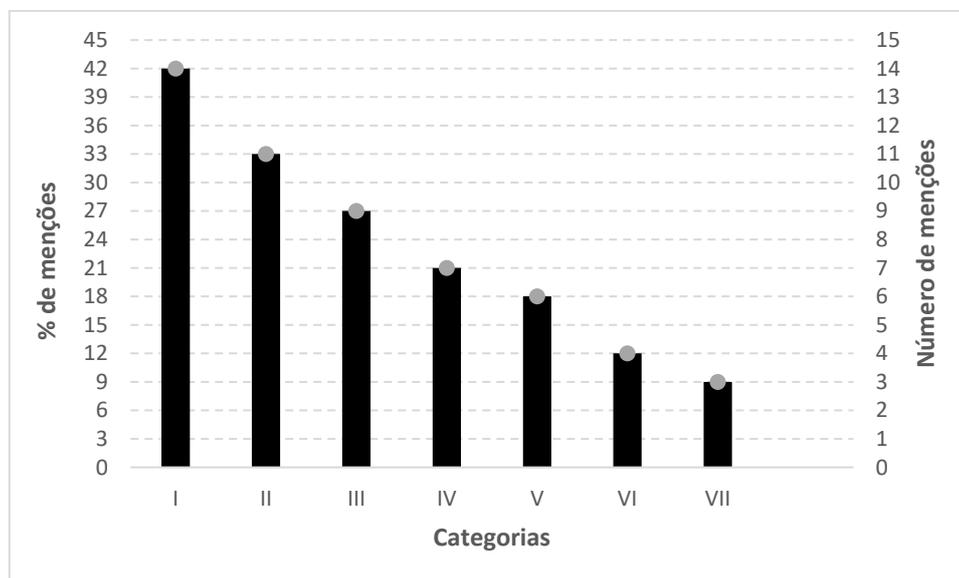


Figure 1– What reasons led you to join this course?

We transcribe below some of the answers collected. In these transcriptions, we have not corrected spelling, grammatical and/or typing mistakes from the original answers:

“Because it was a great institution and had the degree I wanted”. Augusto

“I wished to study Astronomy. I discovered Physics in the 5th grade of K-12, with a Science teacher I had that was an astronomer, she’d tell her stories, what she researched! I’ve noticed that Physics was closely related to Astronomy. Then I decided to study Physics, besides that there was the degree here in the city, which made it easier”. Roberto

“It is a public educational institute, well-renowned and closer to my hometown”. Fabrício

“The reason is because I wanted to be a teacher and I always did better in the area of exact [sciences], that is why [I chose] Physics. And the fact that it’s a public institution”. Margarida

Regarding item “b” of the first question, on the students’ preference or not for the degree when enrolling, for 16 out of the 33 respondents (48%) the Physics Teaching degree was, at the time of admission, their course of preference. Such results show that many students, enrolled at the time of the questionnaire, developed the commitment with the course and/or were getting attached to the commitment with the institution and/or continue in the course to

satisfy personal intentions of diverse natures. With the exception of those who have developed some commitment with the course, the other cases encompass students that seem to us more susceptible to dropout. Besides this, if the dropout does not take place and these students graduate, it is possible that they will not work in the profession or will become dissatisfied professionals (Bueno, 1993).

Crossing the answers given to items “a” and “b”, we have noticed that, out of the 33 students, 14 (42%) show in their answers that they had high levels of initial commitment with the course and with the institution. That is: in their answers we have seen evidences that Physics and/or teaching was their preference and that the prestige and/or quality and/or location and/or gratuity were factors that motivated them to join the institution. Ten (30%) showed that they only had high levels of initial commitment with the course and seven (21%) had only high levels of initial commitment with the institution. In the answers of two of them (6%) we could not identify elements that could indicate the presence of these initial commitments.

It is worth mentioning that to participate in this research, the students had to be enrolled in the degree, that is, students whose sum of levels associated with the commitments with the institution and the course, at the time of data collection, was kept above the levels that tend to result in dropout. In fact 31 of them (94%) pointed out reasons to join the course which positively impacted one of these commitments or two at once.

During the time we applied the questionnaire and the following eight months, 4 out of the 31 students graduated and 2 dropped out – the other 25 continued enrolled. Among those who dropped out, one stated that, when admitted in the course, he had a high commitment level with the course and the institution; and the other had a high level of commitment with the course. Though these are only two cases, they offer us evidences that confirm the dynamic of these levels associated with the initial commitments. According to Tinto’s model, such levels are continuously reformulated by the integration of students with the academic and social systems and their external commitments.

Between the two undergraduates with whom we could not identify elements that indicated the presence of initial commitments, between the application of the questionnaires and the following eight months, one graduated in the course and the other continued to be enrolled. One student has even pointed out in the answer given to item “a” (on the reasons to

enter the course) that he developed/strengthened his commitment with the course during his pathway in the institution:

“Few opportunities. But during the course I’ve started to like Physics more and more”. Tarcísio

Again, it is evidence that corroborates Tinto’s model that the intentions and initial commitments can be continuously reformulated. In fact, Tarcísio, when entering the course, he hinted that he had no pre-established commitment with the degree – which changed when he developed his taste for Physics.

The answers given to the second question (Have you ever thought about dropping out? What reasons led you to that?) highlight that, out of the 33 participants, 19 (58%) had already thought about dropping out of the course. The main reasons that led them to this thought were: difficulties to learn/approval and the problems to conciliate study and work.

We exemplify bellow some answers we received:

“Yes, there are always problems with the subject and the professors”. Mauro

“Yes, the time of the classes makes it difficult to get a job”. Augusto

“I haven’t thought about dropping out yet, because I like what I do and like the institution where I study”. Cristina

“Yes. The difficult career of a teacher, it’s difficult to adapt to the city and the institution, and the lack of interaction among the students”. Fabrício

Once more, as the answers were open, a certain answer could have various units of meaning. These were grouped into nine categories: I: difficulty to learn/be approved in the subjects; II: difficulty to conciliate study (time/schedule) with the need to work (finances); III: devaluation of teachers’ careers; IV: lack of interaction and relationship problems with classmates; V: personal problems (depression, for example); VI: relationship problems with the professors; VII: difficulty to adapt to the city where the institution is located; VIII: would like to do another degree, follow another career; IX: difficulty to adapt to the institution.

In the graphic of figure 2, below, each black bar regards one of these categories. The height of the bars refers to the percentage of mentions, calculated in relation with the totality of 19 affirmative answers to the questions and visualized based on the vertical left axis of the graphic. The grey circles, that seem connected to the black bar, refer to the absolute quantities (whose sum is over 19, as each participant that affirmatively answered the question could point out more than one reason). The values associated with these grey circles, i.e., the absolute number of mentions related to each of the nine categories of reasons that can be seen in the vertical right axis of the graphic.

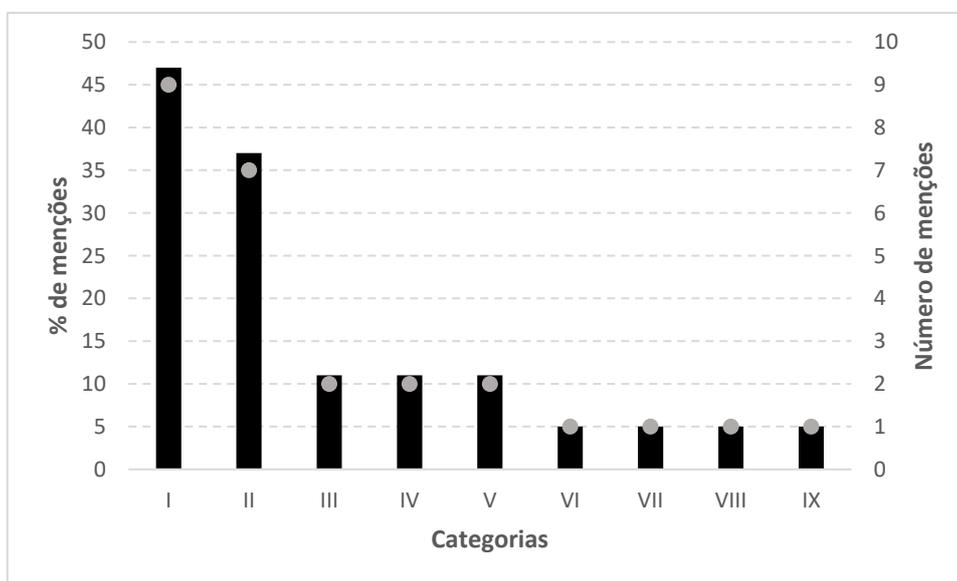


Figure 2 – What reasons led you to think about dropping out of the degree?

According to Tinto (1987), students' permanence in Higher Education is influenced by their interactions with the academic and social systems, and external commitments. Considering the categories that emerged from our analysis, we have evaluated that the reasons assembled in categories I, VI, and IX are associated with students' interaction problems with the academic system; those grouped in categories IV and VII to students' interaction problems with the social system; and those in categories II and III to external commitments associated with the commitments to the course and to the institution. The reasons assembled in category V cross all these spheres and those grouped in category VIII reflect the lack or low level of initial commitment with the course.

It is worth highlighting the relevance of the reasons that compose categories I and II, which, together, represent 61% of students' indications (the sum of all indications is equal to 26). Besides this, these are problems that, at first, can be targeted by institutional actions that aimed to solve or, at least, minimize them – we will return to this discussion later.

Crossing the answers to the second question with those of item “b” of the first question, we have noticed that, among the 19 undergraduate students who considered dropping out the course, 13 (68%) have said that the degree was not their preference, and 6 (32%) have answered that the degree was their favorite. Among these 19, 4 (21%) had high levels of initial commitment with the course and the institution; 6 (32%), only a high commitment with the course; 7 (37%), a high level of commitment with the institution; and 2 (11%), apparently, had none of these initial commitments.

Among the 14 undergraduate students who said they had never thought about dropping out, 10 (71%) have affirmed that the course was their favorite when admitted and 4 (29%) wished to do another degree. Besides this, 10 out of 14 (71%) had high levels of initial commitment with the course and the institution, and 4 (29%) a high initial commitment with the course. Together, these results offer evidence to consider that students with high levels of commitment, especially towards the course, tended to be contrary to the idea of dropping out, even if their integration with the academic and social systems, and the external commitments would diminish the initial commitment.

On the other hand, students' integration with the academic and social systems and the external commitments could also act to increase the level associated to the initial commitments, even the preference for the degree, as shown by Roberto's answer, presented below:

“It became my preference after I actually knew it, but I still intend to study Astronomy someday”. Roberto

Other cases to be highlighted are those of Leticia and Juliana. Both had this degree as their preference and affirmed that they had never thought about dropping out. However, this happened between the application of the questionnaire and the following eight months, i.e., both dropped out. In other words: the decision to drop out can grow with time or can suddenly happen, as was the case of these two students.

The results to the third question, related to the causes of dropout in the degree investigated, according to the perspective of enrolled students are systematized in the graphic of figure 3, below. The units of meaning raised from the answers were grouped into seven categories: I: difficulties of learning/success in the subjects; II: difficult to conciliate study (time/schedule) with the need for a job (finance); III: preference for another degree or regretting the school choice; IV: lack of K-12 knowledge; V: students' lack of dedication; VI: lack of perspective and value of teachers' career; VII: professors' lack of support/attention towards the students; VIII: personal/family problems.

In the graphic, each black bar refers to one of these categories. The height of the bars refers to the percentage of mentions, calculated based on the total of 33 participants and seen based on the vertical left axis of the graphic. The grey circles, connected to each black bar, refer to the absolute quantities. The values associated with these grey circles, i.e., the absolute number of mentions related to each of the eight categories of reason, can be seen based on the vertical right axis of the graphic.

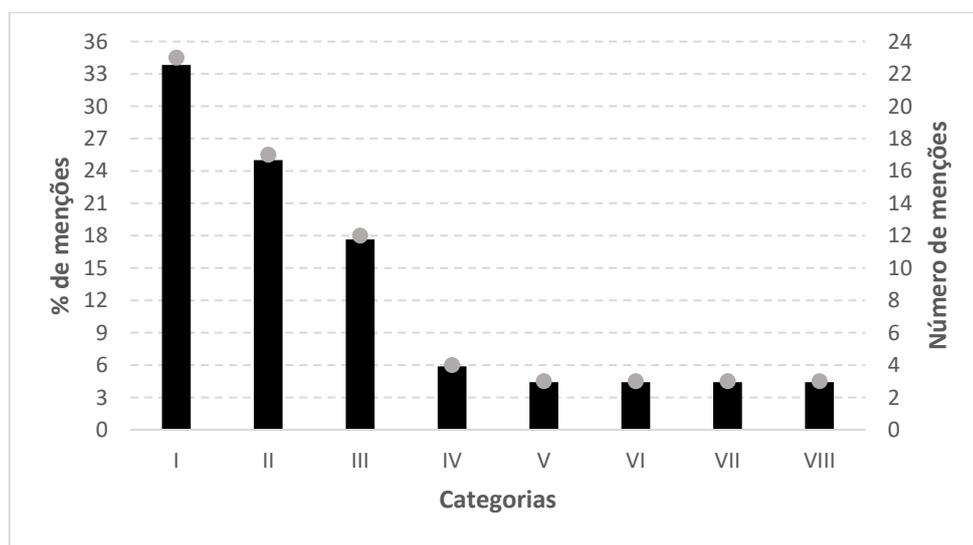


Figure 3 – Causes of dropout according to the students

Considering these categories, we have seen that the causes grouped in the categories I, IV, V and VII are associated to students' interaction problems with the academic system; and those grouped in categories II and VI to external commitments. The causes grouped in the category VIII pervades all these spheres. The causes assembled in category III, in its turn, reflect

the lack or low level of initial commitment with the course. We considered that only the causes grouped into categories III, VI, and VIII are difficult to tackle by the institution, as they escape its direct scope of action.

We transcribe below some answers written by undergraduate students on the factors that led their classmates to dropout:

“Difficulty with the subject, professors’ lack of attention, schedule of the university”. Marta

“It is a difficult course and not all the members of the faculty support the fragility of the students who joined the degree. For those in their first degree, this is a barrier, the students don’t always perceive their role in the teaching/learning process and few teachers are available to show the student this role. As professors, they should perceive and teach the student to be a student”.
Juliano

“They have not identified themselves with the degree, many have entered due to a lack of options or believed it would be easier, the degree requires an intense dedication, if they are not willing or work, then it is complicated. Having to repeat a subject can be demotivating.” Julio

“The lack of prospective jobs in the area, the degree is hard and demands a lot of study, low salaries incompatible with the difficulty with the degree”. Davi

In general, the factors pointed out by students in questions 2 and 3 agree with those in Table 1 from the compilation of causes pointed out by the literature for Higher Education dropout. The only factor that appears in some answers and not in the literature, refers to the lack of dedication of the students in their own perspective (and not according to professors’ view). This would be the case of students who would have free time, but would not use it to study and not the case of those who have a short time due to external commitments. We believe that this lack of dedication derives from aspects such as the low level of commitment with the course, not having the habit of studying – strongly related to not having developed this habit during their K-12 studies – and the predominance of personal interactions (as making friends and building romantic relationships) to the expense of the commitments with the course and the institution.

Finally, regarding the fourth question, related to the action that could be taken to avoid/reduce dropout, the enrolled students pointed out as the main possibility a higher professorial and institutional sensibility regarding their learning difficulties.

In the graphic of Figure 4, below, we systematized the units of meaning raised from the answers into 13 categories: I) higher sensibility of the faculty towards students and their learning; II) more systematic institutional action to offer actions that help students overcome their learning difficulties; III) adaptation of course times to better attend the students; IV) increase of scholarships offered to students, so that they can dedicate themselves more to the studies and less to their financial support; V) increase the knowledge of the students about the course, the opportunity of activities in this context, and the possibilities of the profession; VI) improvement of interpersonal relations among the students; VII) increase the possibilities to listen students' opinions on the degree; VIII) increase social value of teaching; IX) higher dedication/seriousness by part of the students themselves; X) change on the perspective of some people about Physics; XI) improvement of educational policies on K-12 education; XII) change of institutional rules related to the success/failure in the subjects; XIII) availability of more nutritious and cheaper food in campus. We remind the reader that the black bars in the graphic refer to the percentage of mentions, calculated based on the total of 33 participants and seen based on the left vertical axis. The grey circles connected to each bar refer to the absolute number associated with each category and should be visualized based on the right vertical axis of the graphic.

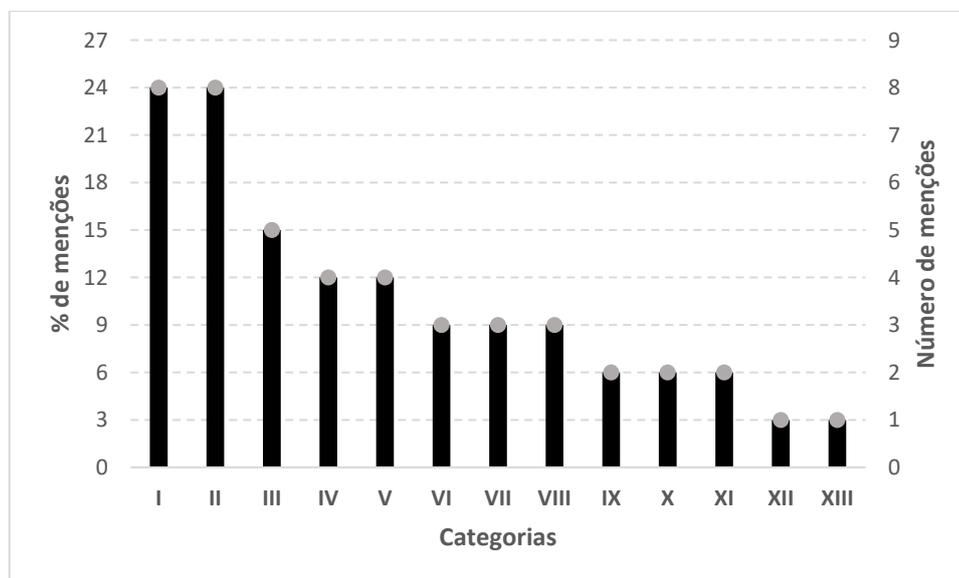


Figure 4 – Actions that could be taken to combat dropout

Analyzing the categories that emerged, we have noticed that most of them encompass actions whose effectiveness is within the scope of institutional possibilities. The actions whose

implementation by institutional decision seem more difficult are groups in categories VI, VIII, IX, X, and XI. Even so, we believe that those assembled in categories VI and IX could be respectively tackled by offering diversified cultural activities to the students and awareness works. Regarding the actions grouped in categories VIII, X, and XI, the institution does not seem able to enact them alone, because, individually, it has little power to influence changes.

We transcribe below some answers given:

“Teachers could support the students showing that the complexity of the degree can be beaten. Well-structured tutoring are also indispensable, because it helps solving the deficiencies that in the classroom cannot be effectively answered. Tutoring could help to beat even time, the greatest enemy in the classroom.” Juliano

“Stronger interactions between students, motivational lectures, and the offer of other actions that makes the student interact and feel more as a part of the institute.” Fabrício

“I think it requires a well-done work in high school, when we’re “presented” to physics, besides having a stronger mathematical base. It is also necessary a stronger appreciation towards teaching, nowadays it’s complicated for students to be interested in becoming teachers, it’s discouraging.” Julio

“To follow the development of students and their difficulties, disseminate better the possibilities of studies and scholarships, to offer solutions for students with greater difficulty to follow the subjects, observe the flaws and try to discover the reasons for them. Another important factor is the lack of more nutritious and cheaper food in the campus, many students live far and even outside the city and this takes its toll in the pocket and in the body.” Jean

“A better approach with the students with problems in the area and a greater preparation of the university towards the students who need to work to continue in the university”. Marta

The results allow us to highlight the fact that, as there is a broad array of potential factors that make the degree have a high dropout rate, there is also a multiplicity of various actions to be taken to reduce this rate.

We have noticed that, in general, there is a similarity among the categories that emerged based on the answers of the participants and the actions to confront dropout summarized on Table 2, from the readings of scientific literature. On the other hand, for some of the categories we built there is no correspondence on the table. Among them: greater dedication/seriousness of the students; social valuing of the teachers’ work; and the improvement of educational policies towards K-12 education. The first, though regarding aspects directly related to students’

posture, can be the target of institutional actions. The two later signal the influence of the socio-educational policies as a whole together with the dropout in a Teaching degree.

Similarly, there is no correspondence between some of the items presented in Table 2 and the actions suggested by the students who participated in our research. Among them: the valuing of teachers' work and the indication of teachers who stand out in their work for the subjects in the beginning of the course. In fact, the participants seem to assume that the whole faculty would be interested in teaching and on the didactic-pedagogical abilities to do so, thus it would not be the role of the institution to motivate professors regarding teaching or indicating those who, in a certain moment, would stand out in didactic-pedagogical terms.

Final remarks

Though the literature points out which are the possible factors that contribute to Higher Education dropout, the analysis conducted in the previous section shows that the influence of each one varies according to the student, the degree, the institution, the moment, and the context. Faced by this complexity, the attempt to quantify the influence of these factors seems a hard task because it is something dynamic.

As we have seen, a great part of students enrolled answered in the questionnaires that they had considered dropping out. In this sense, the factors that contribute to the dropout in the degree have also been acting upon them, reducing the levels associated with their personal intentions and commitments with the course and the institution. In contrast, these students seem to find in the influence of other factors, which we could call factors of permanence, the necessary power to keep the sum of the referred levels above those who would lead to dropout. Therefore, dropping out or continuing is a decision evaluated and continuously taken during students' interaction with external commitments and their integration with the academic and social systems. In other words, the intentions and initial commitments are continuously reformulated, the levels associated to them are continuously reviewed, when increased they would incentivize permanence, when reduced they would incentivize dropout.

We could even make an analogy between the viewpoint allowed by the model of Tinto on the dropout phenomenon and the situation of a liquid reservoir. It is an analogy that, apparently, was still not used by the literature – besides the studies previously stated, we

consulted: Arruda et al. (2006); Kipnis (2000); Lima Junior et al. (2012); Micha et al. (2018); Oliveira (2016); Ramos (2013); Santos (2018); Silva (2018); and Souza and Gomes Junior (2015). According to the theoretical model we used, when admitted to the degree course, students can have higher or lower levels associated with their intentions and initial commitment with the course and the institution. In the analogic relation proposed, the greater the sum of these levels, the more filled with liquid the reservoir would be. A filled reservoir would correspond to the students who preferred the degree and the institution when entering university. After the admission in the degree, the external commitments and how students integrated with the academic and social systems will, continuously, affect the levels associated to their intentions and initial commitments. In the analogic relation, the result of these interactions would mean injecting or removing liquid already present in the reservoir. Students whose reservoirs were filled with a reasonable amount of liquid would be those that do not think about evading. Those whose reservoirs, in certain moments, lost too much liquid, getting almost dry, would be those who would consider dropping out. Students who have high levels of initial commitment, especially with the course, tended to be contrary to dropping out: they had already started their way with a filled reservoir. The analogy also allows us to describe the case of the two students who dropped out after the research data collection. Both did not think about dropping out, that is, had good levels of liquid in their reservoirs. However, the need to handle unexpected external commitments was fatal: as if an external agent would burst the reservoir, quickly leaking all liquid. In fact, our analysis showed that the decision to dropout could be abrupt, or consummated after the accumulation of situations that cause the decrease in the levels associated with the intentions and initial commitment of a student with the course and the institution.

Differences between the results we obtained regarding the causes and possible solutions for dropout and the tables we created from the literature on the topic show the relevance of carrying out continuous studies in each degree/institution. Even though they serve as a general panorama, such tables are incapable of describing the particularities of each reality. In the specific case, we highlight that most factors indicated as causes of dropout, mainly the difficulties of learning/success, could be the target of institutional actions that aim to minimize or eliminate its influence. In this sense, working in favor of overcoming these difficulties, and, consequently, the decrease in the number of failures, could also avoid the consolidation of fears of defeat, hard to overcome (Lima Junior et al., 2012).

We especially noticed that the action most indicated by students as a way to combat dropout was a higher sensibility of the professors and the institution regarding learning difficulties. This is even more relevant in the beginning of the degree, a period when dropout rates tend to be higher (Machado et al., 2005; Silva Filho et al., 2007) – a finding that agrees with our empirical observations in the course researched.

Finally, we expect that our results have helped to demystify the position that, according to Mazzetto and Carneiro (2011), is commonly assumed by professors and the institution as a whole: that students are the only ones to blame, who do not have the previous knowledge or interest to continue the degree. It is not a way to excuse undergraduates from their responsibilities – as indicated in the answers of some students who answered our questionnaire -, but to work so that the processes of exclusion and institutional omission do not result in dropout.

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Submission data:

Submitted for evaluation May 18, 2020; revised October 6, 2020; accepted for publication in February 23, 2021

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