Academic performance: perceptions of Physics students from a University in Minas Gerais

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ABSTRACT

This article comes from empirical research on students perceptions of the Physics course at university in Minas Gerais, about the low academic performance in five subjects of the first year, which are considered difficult according to the institution's criteria and whose failure rates have been higher than 50% for more than a decade. The data were obtained through the documents available by the university's dean of undergraduate studies, the application of questionnaires and the conduct of interviews with students. The results showed different perceptions regarding retention in the course first year and indicated the need for greater dialogue between students, teachers, and the institution, aiming at the elaboration of integration and student affiliation strategies and, consequently, the improvement of academic performance.

KEYWORDS

Retention. Academic achievement. First university year. College education. Physics teaching.

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Desempenho acadêmico: percepções de discentes do Curso de Física de uma Universidade Mineira

RESUMO

O presente artigo aborda uma pesquisa empírica sobre as percepções de discentes do curso de Física de uma universidade pública mineira acerca do baixo desempenho acadêmico em cinco disciplinas do primeiro ano, consideradas difíceis segundo critérios da instituição e nos quais as taxas de reprovação têm sido superiores a 50% há mais de uma década. Os dados são oriundos de documentos gerados a partir da aplicação de questionários e da realização de entrevistas com os alunos e disponibilizados pela pró-reitoria de graduação da universidade. Os resultados evidenciaram diferentes compreensões a respeito da retenção no primeiro ano do curso e indicaram a necessidade de maior diálogo entre discentes, docentes e a instituição, visando à elaboração de estratégias de integração e afiliação estudantil e, consequentemente, a melhoria do desempenho acadêmico.

PALAVRAS-CHAVE

Retenção. Desempenho acadêmico. Primeiro ano universitário. Educação superior. Ensino de física.

Rendimiento académico: percepciones de los estudiantes del Curso de Física en una Universidad de Minas Gerais

RESUMEN

Este artículo aborda una investigación empírica sobre las percepciones de los estudiantes del curso de Física en la una universidad de Minas Gerais, sobre el bajo rendimiento académico en cinco materias del primer año, considerado difícil según los criterios de la institución y cuyas tasas de fracaso han sido superiores al 50% para más una década. Los datos provienen de documentos puestos a disposición por el decano de estudios universitarios de la universidad, la aplicación de cuestionarios y la realización de entrevistas con estudiantes. Los resultados mostraron diferentes percepciones con respecto a la retención en el primer año del curso e indicaron la necesidad de un mayor diálogo entre los estudiantes, los docentes y la institución, con el objetivo de elaborar estrategias de integración y afiliación estudiantil y, en consecuencia, la mejora del rendimiento académico.

PALABRAS CLAVE

Retención. Logro académico. Primer año universitario. Educación universitaria. Didáctica de la física.

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1 Introduction

In recent years, access to public Higher Education has expanded because of governmental actions, such as the University for All Program (ProUni), created in 2004 (BRASIL, 2005), and the Support Program for Restructuring and Expansion Plans for Federal Universities (REUNI), established in 2007 (BRASIL, 2007). However, the permanence of students until graduation has not necessarily followed this expansion. One of the associated problems is the low academic performance, which leads to successive retentions and is related to the evasion especially in the first years, when this phenomenon occurs with greater intensity (BRAGA; PEIXOTO; BOGUTCHI, 2003; LIMA; ZAGO, 2016).

A course that has drawn attention for its retention rates is the undergraduate course in Physics, in the undergraduate or bachelor's degree modality (RIBEIRO et al., 2008). In Brazil, in general, most students who enroll in it do not graduate or take significantly longer than the time proposed by the institution to complete it. On the one hand, this picture is justified by the predominant profile of students who enter this course, and, on the other, by the challenges they face already in the first year of graduation.

Although there are exceptions, the students of Physics courses in Brazil, in general, are young people of low socioeconomic status who come from more irregular school trajectories and, in many cases, reconcile work and study throughout the undergraduate course (SOARES, 2014; RIBEIRO, 2015). Added to these limitations are internal challenges to the institution, such as the nature of some mass subjects offered to this and other courses in their first semesters. These are disciplines poorly contextualized to the specificities of each course, whose contents are of high abstraction and difficulty, and that in most cases are taught by teachers with high mastery of the content they teach, but little pedagogical preparation for teaching (ALMEIDA, 2012). Because of this confluence of factors, the first year of Physics courses in the country has been marked by a scenario of low academic performance and high retention rates (RIBEIRO, 2015).

According to (COSTA et al., 2015), elevated levels of failure and dropout promote frustration of expectations; loss of personal, professional, and social potential; social burden with the increase in public spending, financial losses to the student and the institution, and compromising the provision of quality teaching and learning.

In view of the above, this paper, the result of a master's thesis, sought to answer the following research problem: What are the perceptions of students of the Physics course at a federal university in Minas Gerais about the low academic performance in subjects considered difficult by the institution?

At this federal university - in this paper, fictitiously referred to as "University X", which has been present for 94 years in the state of Minas Gerais - the Physics course is offered in the daytime and nighttime shifts, in two modalities: bachelor's and undergraduate, with the nighttime course offering only the latter. The Physics course has been part of the

Exact Sciences Department of this institution since 1968, although its origin is linked to the university's former School of Philosophy, founded in 1939. In 1972, the undergraduate and graduate courses were separated, maintaining the presence of many common subjects, currently distributed over eight semesters, i.e., four years of duration.

Thus, the objective of this article was to investigate the perceptions of these students, of the modalities Bachelor (daytime) and Degree (daytime and nighttime), about the low academic performance in five subjects of the first year of the course: Computer Programming (DCC 001), Differential and Integral Calculus I (MAT 001), Analytic Geometry and Linear Algebra (MAT 038), Fundamentals of Mechanics (FIS 065), Differential and Integral Calculus II (MAT 039). According to annual reports produced by the institution's pro-rector of undergraduate studies, these subjects are considered difficult, and their failure rates were higher than 50% in the period between 2006 and 2016 (UNIVERSITY X, 2017a, 2017b)[1]. The concept of difficult was assigned by the authors of these reports on student performance in the subjects that have the lowest yields within the course and the highest failure rates.

The choice for first-year subjects resulted from studies on academic failure and integration into higher education that have turned their gaze to this delicate period of student life (TINTO, 2002; CHARLOT, 2006; COULON, 2017). The literature on this theme has been growing and providing elements for new investigations, although they still need to expand in the national context.

Works regarding retention and permanence in Physics courses have already been produced nationally, but there is a lack of analyses that highlight the perception of the main subjects involved in this phenomenon: the students. In this sense, this work seeks to innovate by bringing the voice of these students and delimiting the first year as the focus of its investigation, since this has been the target of current research on permanence in higher education. In this research, it is not considered that the perceptions highlight the real causes of retention in this course, in a tangible and factual way, since they concern subjective views of each subject of speech about this phenomenon. However, the work with student perceptions, especially in disciplines of the basic cycle of exact sciences, is original and pertinent as it allows the elucidation of probable causes of low academic performance, as well as elements that point to new investigations.

1.1 Challenges facing the Brazilian university today

At the beginning of this century, Brazilian higher education experienced a significant expansion process. According to Segenreich and Castanheira (2009), between the years 2001

[1] Reports published in the year 2017, by the Statistics sector of the pro-rectory of Undergraduate Studies of the university, as part of the Collection of Technical Reports on the Evaluation of undergraduate courses of the institution. In these reports, the data of the daytime and nighttime Physics courses were considered, in the period from 2006/1 to 2016/2. In 2018 and 2019 new reports were published, considering the period from 2007/1 to 2017/2, and 2008/1 to 2018/2. The data from the latter show that there has been no substantive change in student performance in each subject analyzed.

and 2006, private higher education increased its enrollments by 206%, while public education grew around 64.4%. Noting that this expansion was not necessarily accompanied by the democratization of access to this level of education, some initiatives were taken. Among them, the creation of the Support Program for Restructuring and Expansion Plans of Federal Universities (REUNI), in 2007, and the institution of Law No. 12,711, the Quotas Law, in 2012 (BRASIL, 2012). Besides these, in 2009, the Unified Selection System (SISU) was implemented, in which public Higher Education Institutions (IES) offer vacancies to candidates participating in the National High School Exam (Enem). The system allows the candidate to follow their ranking on the exam and adjust their choices, which in some cases are for courses with a higher probability of approval, even if they are not their preference.

The measures have contributed to the democratization of access to higher education, especially regarding minorities historically excluded from this level of education, such as public-school students, black, brown, and indigenous students, as pointed out by Neves and Martins (2016) and Gomes, Taylor, and Saraiva (2018). However, according to Moreira, Moreira, and Soares (2018), this process was not accompanied by the necessary increase in the number of resources passed on to universities, institutions responsible for maintaining not only teaching, but also research and extension. According to Moura and Passos (2015), in the context of the creation of Reuni, there was not enough investment to meet the demands generated by the increase in the number of enrollments caused by the program. Thus, the work of public servants of federal universities, including professors, was significantly intensified.

It can be said that the Brazilian university is currently undergoing transformations related to the conceptions and objectives that define and guide it. For Chauí (1999), in this new model of university, which she calls operational university, the institution is placed as a service provider for the competitive market, with a reduction of its public space of right, and the so-called culture of performance is installed in it (SANTOS, 2005). Thus, the university starts to be evaluated based on indicators imported from the business sector, considering criteria of economy, effectiveness, and efficiency.

These changes in the university were produced by alterations in the role of the State due to economic and political variations resulting from the development of contemporary capitalism (CHAUÍ, 1999). In this scenario, in which an economists view of education predominates, for Moreira, Moreira and Soares (2018), some measures are crucial for the university not to lose its role of human and social transformation, so that there is an effective democratization of access to higher education and reduction of inequality of access to knowledge during graduation. Such inequality, according to Coulon (2017, p. 3), "[...] remains a persistent and disturbing phenomenon, particularly spectacular in the first university cycle."

This new model of university also affects the teaching work, in such a way that teaching is relegated to second place before so many other activities taken on by university professors (LIMA; LIMA, 2018). In face of this culture of performance, all the production of

the professors is evaluated in quantitative terms: number of articles, book chapters, funded projects, students, and so on. The prestige and valorization of the teaching career does not come from teaching in this university configuration, but from research, which makes teachers, in general, have less time and incentive to dedicate to the teaching-learning process.

In addition, teachers lack basic elements that should guide their practices, such as knowledge about planning processes and class organization, teaching and assessment methodologies and strategies, pedagogical knowledge and understanding of the particularities inherent to the interaction between them and the students (PIMENTA; ANASTASIOU, 2005; ALMEIDA, 2012).

In addition to the challenges posed to the Brazilian university, the first year of graduation, in which the transition is made from high school to higher education, constitutes a critical moment for students and another problem to be overcome by higher education institutions.

1.2 Academic performance in times of learning the student craft

When entering higher education, the student is faced with a new educational universe, governed by new rules, times and spaces. As Coulon (2008) points out, the belief that university would be a natural continuation of high school by some students is soon invalidated and replaced by a time of strangeness in relation to the institution. It happens that, in the process of transition from high school to higher education, there is the challenge of making students go beyond the culture of the former and learn a new culture, more complex, codified, and symbolic, which is that of the latter.

To assimilate this new culture, it is necessary for the student to learn the so-called "college student craft", going through three stages: strangeness to the unique environment, learning the norms that manage it, and, finally, affiliation to the institution (COULON, 2008). An affiliated student, according to the author, is one who has learned to use the new institutional and intellectual codes that are indispensable to his or her new craft. To become affiliated to the university is to understand the rules of this new space - the practices, which despite being naturalized, need to be learned - and to develop what Charlot (2006) points out as a new relationship with knowledge.

According to the latter author, students arrive at the university carrying a relationship with knowledge built throughout their school career, which tends to be abruptly broken in the transition to higher education, which can culminate in situations of academic failure and low academic performance. In his perspective, one way to combat this phenomenon is to make students, coming from the most diverse backgrounds, relate to knowledge in a pleasurable and meaningful way, learning the logic that governs learning in this new context (CHARLOT, 2006).

According to Tinto (2002), another essential dimension for the students to remain in the institution and have good academic performance concerns their integration to the university. This integration, which occurs in a social or academic way, is influenced by several characteristics, such as individual attributes, previous school experiences, social and family context. The author states that a good social relationship tends to contribute to good academic integration and vice versa.

The last three authors cited have in common a concern with school failure. Coulon (2008, p. 21) warns that "[...] an incredible potential for intelligence and development is still highly underutilized because of a troubling failure rate." Charlot (2005) advocates a positive reading of the social reality, not justifying low academic performance situations in terms of students' social and cultural deficiencies but seeking to understand how they relate to knowledge. Tinto (1990), in turn, believes that the creation of programs in the first year of college aimed at the social and intellectual integration of students will increase the academic success of students throughout their undergraduate studies.

2 Methodological course

The master's research that originated this article was an exploratory study of quanti-qualitative approach (SOUZA; KERBAUY, 2017). As for the procedures, it involved a documental research - in which files were analyzed, such as the Reports of Evaluation of the Academic Performance of Physics students and the curricular structure of the course - and field research in which data were collected with the students of the Physics course of the federal university in question by means of questionnaires and interviews. To preserve the subjects involved in this research, we chose to give a fictitious name to this university, and in this work, it will be named as "University X", when references are made to works produced by the institution, for example.

The criterion for choosing the subjects who took part in the field research was the enrollment in the five disciplines chosen for the investigation: Computer Programming (DCC 001), Differential and Integral Calculus I (MAT 001), Analytic Geometry and Linear Algebra (MAT 038), Fundamentals of Mechanics (FIS 065), Differential and Integral Calculus II (MAT 039). As previously stated, these are subjects offered in the first year, considered difficult and whose failure rates were higher than 50% in the period between 2006 and 2016 (UNIVERSITY X, 2017a, 2017b). The data were collected in the year 2018 and the participating students entered the course in 2017 or previous years.

We analyzed 105 questionnaires answered by the students, using the descriptive statistical analysis technique (REIS; REIS, 2002). At this stage, students answered an online form, sent with the support of the course coordinator, via institutional email, which contained questions organized into thematic blocks.

In a second step, five respondents with distinct profiles and school and academic trajectories[2] were selected among the questionnaires to be interviewed. We chose the semi-structured interview (ALVES MAZZOTI; GEWANDSNAJDER, 1999), because it followed a previously planned script, but could be extrapolated, if necessary. According to Minayo and Sanches (1993), speech reveals structural conditions, values, norms, symbols, and representations of groups in a certain historical, social, and economic context, through the voice of the interviewee. The interviews conducted with these students were centered around four axes: 1) school trajectory; 2) choice of course; 3) student experiences in higher education; and 4) perceptions about retention.

For the analysis of the interviews, we used the content analysis technique, of the thematic type (BARDIN, 2009). Thus, the transcribed speeches of the participants were read and organized into categories and the results were interpreted and analyzed in the light of the theoretical framework of the research.

3 Results

3.1 Students' views on retention, according to the questionnaires

In the first semester of 2018, the year in which the questionnaires that composed the field research were applied, there were 379 students enrolled in the Physics course of the institution, entering in 2017 or previous years. Of these, 28% were students in the evening undergraduate course, 13% were daytime undergraduate students, and the majority, 59%, were students in the bachelor's course, offered exclusively in daytime shifts.

A total of 113 students from this population answered the questionnaire. We tried to establish some correspondence so that the group of respondents per modality and shift was proportional to the size of each stratum of the initial population. For this, 8 questionnaires were randomly eliminated. This left 105 questionnaires, which corresponds to 27.63% of the population. In addition, the proportion of each stratum (daytime and nighttime undergraduate and bachelor's degree) was maintained, which can be seen by comparing the column "Attending" in table 1 with the data in table 2, both below.

[2] Both high and low academic achievers and different school trajectories were chosen to participate in this step, as shown in Table 3 in the Results.

Table 1. Student status - completion, exit and permanence (In Course) of students entering between 2006 and 2016

Turno	Conclusion		Exit from Course		Attending		Total	
	Freq.	%	Freq.	%	Freq.	%	Freq.	%
Daytime	208	24,13%	388	45,01%	266	30,86%	862	100%
Night time	99	18,23%	349	64,27%	95	17,5%	543	100%

Source Daytime and Nighttime Physics Student Performance Evaluation Reports (UNIVERSITY X, 2017a, 2017b; Adapted)

Table 2. Questionnaire response rate by stratum of the initial population

Year Entered	Nighttime Undergraduate	Daytime Undergraduate	Bachelor Daytime
2017 - Previous	29 (28%)	14 (13%)	62 (59%)
TOTAL	105(100%)		

Source: Prepared by the author from data provided by the course coordination.

As can be seen in table 1, between 2006 and 2016, a total of 361 students studied Physics at the institution, of which 266 were day shift students (74%), in the undergraduate and bachelor's degree modalities, and 95 were night shift students (23%). Table 2 shows a similar proportion of students who participated in the survey, with 28% of students from the night shift and a total of 72% of students enrolled in the day shift, when undergraduate and undergraduate courses are added together.

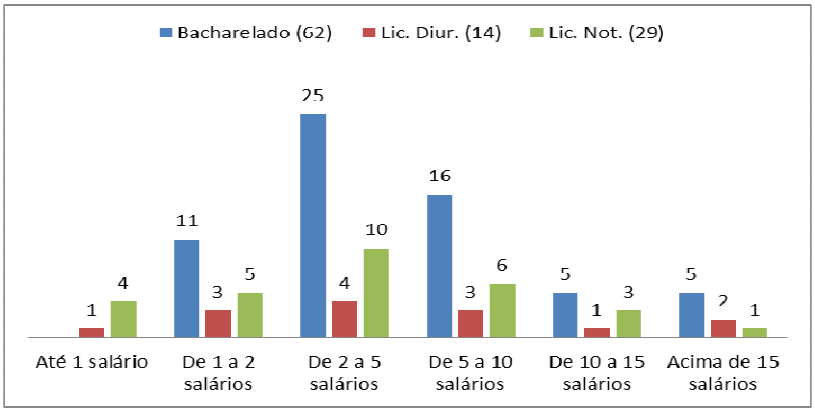
In this stage, the students answered questions regarding: the year and form of entering the course; the chosen modality and shift; their social and school characteristics; the main motivations for choosing the course; self-evaluation regarding dedication to studies; participation in extracurricular activities; the situation regarding approval or retention in the selected subjects; evaluation of the teaching in these subjects; the relationship established by them between retention and course evasion, among others. Thus, a profile of these students was drawn. The answers given to the questionnaire were organized in five thematic blocks: 1) socioeconomic profile; 2) school trajectory, 3) entrance to the course; 4) student experiences in undergraduate studies and 5) academic performance and retention.

3.1.1 Socioeconomic profile and school trajectory of the students participating in the research

The questionnaire applied to 105 students indicated a predominance of male students (78), aged between 19 and 22 years (57), who lived with their parents (63), and who had already worked during their graduation (58). Regarding family income, it can be observed that more than half of the students declare to belong to families that receive from 1 to 5 minimum wages (63), while a small portion (17) comes from families that receive 10 or more

minimum wages. The latter group has a higher concentration of students attending the bachelor's degree program, as can be seen in Graph 1.

Graph 1. Approximate income of the students' family nucleus



Source: Research Data

Regarding their school trajectories, the data indicated that 57 students attended all their high school education in public schools, while 40 did so in private schools and 8 moved between the two types of institutions. Such data is in accordance with the profile of Physics students in the country, as pointed out by Ribeiro (2015).

According to most respondents, their performance in the subjects of mathematics and physics in high school can be classified as "good" or "excellent". 90 among the 105 respondents consider themselves to have aptitude for learning exact sciences, which was denied by only 14 (14.3%) of the participants. The variable "aptitude" for exact sciences tends to be considered by teachers and students as relevant for academic success in the Physics course, and the lack of it as a justification for retentions.

3.1.2 Entering the course: students' choice and career aspirations

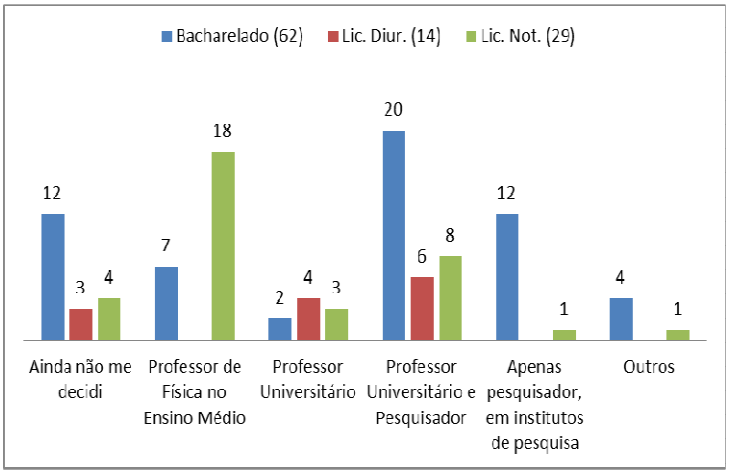
When entering the course, two factors are at play: the process of choice and the students' professional aspirations. Regarding the choice for a higher education course, studies such as that of Nogueira (2004) point out that this often occurs for reasons other than the desire in the first instance to complete it and become a professional in the area. Other studies, such as that of Saraiva, Silva and Ferenc (2012), point out that the advent of SISU, the means of entry of most students enrolled in the course (71 students), contributed to intensify this phenomenon.

When asking students about the main reason that led them to choose the physics course, the following result was obtained: of the 105 respondents, only 12 (11.4%) claimed to have made this choice because "it is a less competitive course in the area" and only 2 (1.9%) did so for "other reasons", not explained. The other 91 (86.6%) students claimed to have

chosen the physics course because they were influenced by teachers or family (4), because they "liked the subject" or had been "good students in the subject" in high school (29), because they wanted to be teachers (13), and most of them were interested in becoming researchers (45).

During graduation, it is necessary to consider students' career aspirations as an essential element in the study of academic performance and retention. According to Tinto (1990) and Coulon (2008), students with clearer professional projects tend to be more engaged in their courses, achieving greater academic satisfaction and success. The research subjects were asked about their professional aspirations and the results shown in the graph below were obtained:

Graph 2. Students' professional aspirations



Source: Research Data

Graph 2 shows that 86 students (82%) stated that they had some professional project when they obtained their degree in Physics, compared to 19 (18%) who had no clear ambitions for their professional future. The data also show that only 25 respondents want to be a "high school teacher", while 43 aspire to be university professors, with the largest number (47) concentrated among those who want to be a "teacher and researcher" or only a "researcher".

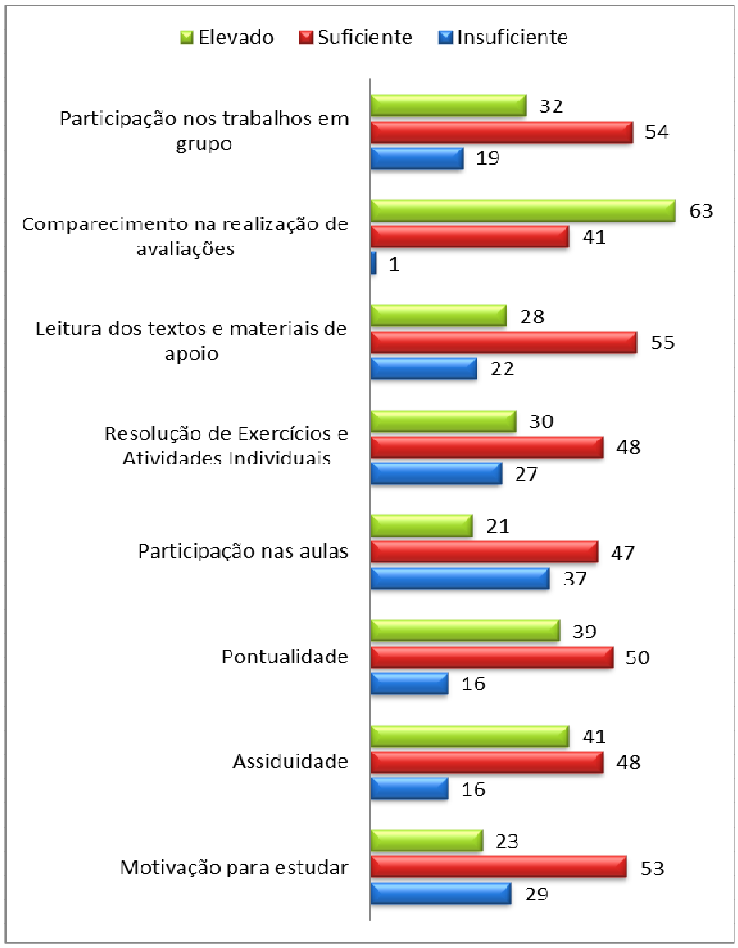
Tinto (1990) and Coulon (2008) share the idea that higher education institutions have the role of helping students with heterogeneous profiles and who entered the course with uncertain or non-existent motivations and projects to define their goals in relation to the course. This constitutes an important challenge for universities at the pedagogical level, since students with clearer professional projects tend to be more engaged in their courses, with greater satisfaction and academic success.

3.1.3 Undergraduate student experiences

Aspects related to the student's involvement with studies, their participation in curricular activities and their perceptions of the relationship between their teachers' pedagogical practice and their academic performance were classified as student experiences in undergraduate studies.

Regarding involvement with studies, the following elements were considered: resolution of exercises, participation in classes, reading of texts and support materials, and motivation to study. The students, in general, rated their behavior in these items as high or sufficient, with the latter predominating. However, 37 students said their participation in classes was insufficient, and 29 claimed to have insufficient motivation to study.

Graph 3. Self-classification of behavior as a student



Source: Research Data

Regarding the involvement with curricular activities, the data collected show that most students participated in scientific initiation research, monitoring, extension, or the Institutional Program for Teaching Initiation Scholarship (Pibid). However, a considerable number of students (38 students, or 36% of the respondents) stated that they were not

involved in any of these activities, which, according to Tinto (2002) and Coulon (2017), is an obstacle to academic integration. The latter author states that poorly integrated students find it more difficult to see themselves as members of the academic community, delaying the affiliation process, which is essential for good performance.

Students were asked about their perceptions of the relationship between their teachers' pedagogical practice and their academic performance. Most students perceive this relationship as medium (45) or strong (40), while 13 believe it is a weak relationship and 7 do not perceive any relationship between these two variables. A strong relationship is understood here as when the teachers' pedagogical practice has a major influence on the students' academic performance, in their perceptions; average when this influence is reasonable, and weak when, for the students, there is little relationship between the two factors. The students' perception of didactics in the five courses analyzed ranged from unsatisfactory to very satisfactory, with the concept of satisfactory predominating in the case of MAT 039, MAT 038 and MAT 001. The subjects FIS 065 and DCC 001 had the worst evaluations on this issue. 42 out of 105 students claimed that the didactics in the first was unsatisfactory, a number that increased to 68 in the case of the second. For Soares and Cunha (2010), this is a problem linked to the lack of pedagogical training of higher education teachers and the precariousness of teaching in the university guided by productivity.

3.1.4 Justifications given for retention

As for retention, it was observed that 69% of the questionnaire respondents (72 students) had already failed some course subject, and 55% (58 students) had failed some course that was part of the survey. The following reasons were given for failing grades, as shown in the following chart:

Graph 4. Reasons for failure

Source: Research Data

As can be seen, the lack of clarity in the teacher's explanation (60), the lack of "basis" for learning (57) and problems (51) were the reasons most often given for failure, in the students' perception. A considerable number of 32 students pointed out that the lack of time to study justifies a failure, and a smaller number of students (13) indicated as a reason the fact of having problems with the teacher.

Finally, another question asked the students about their perception of the relationship between academic performance, retention, and dropping out. The 83% of the respondents stated that having a low academic performance and being retained has a strong or strong relationship with the decision to drop out of the course. It is important to emphasize that studies on this phenomenon point out that the decision to drop out of a course does not happen "overnight", but after several years of retention (LIMA JUNIOR; SILVEIRA; OSTERMAN, 2012). This statement and the data collected in this study are in line with the study of Granja (2012), which points out that low academic performance is closely related to dropping out of the course.

3.2 How the students interviewed perceive the retention phenomenon

After the application of the questionnaires, 5 students were selected to be interviewed with the objective of understanding in more depth some of the questions raised in the first instrument. Three representatives of the undergraduate modality were chosen, one student from the daytime undergraduate course and one student from the night undergraduate course. We started from the premise of Poupart (2008) in which the subject interviewed is seen as a "key informant" because he is considered representative of his group. Table 3[3] shows the profile of the participants of this second stage[4].

Table 3. Profile of students selected for interviews

Fictitious Name	School Trajectory	Family income	Modality and shift	Year Entered	First Year Retention
Lucca	Only private school, no scholarship.	High	Bachelor Daytime	2017	no discipline
Aline	Public school only	Medium	Bachelor Daytime	2013	DCC 001: 1x
Mauricio	Public school only	Low	Bachelor Daytime	2017	DCC 001: 2x MAT 001: 1x MAT 038: 2x FIS 065: 1x
Pedro	Public school only	Medium	Undergraduate	2015	no

[3] We considered here, for comparison purposes, as low family income those between 1 and 2 minimum wages (from R$937.00 to R$1,874.00), as medium incomes those between 2 and 5 wages (from R$1,874.00 to R$4. In this study, we used the following criteria: the minimum wage in force in the year the questionnaires were applied; the family income was between 2 and 5 salaries (R$1,874.00 to R$4,685.00) or between 5 and 10 salaries (R$4,685.00 to R$9,370.00); and a high family income was that between 10 and 15 salaries (R$9,370.00 to R$14,055.00) or above this amount, considering the minimum wage in force in the year the questionnaires were applied.

[4] The participants had their real names changed to fictitious names to preserve their identities.

			Nighttime		discipline
Fabricio	FE: Private School Only FS: Federal Public School Only	Medium	Daytime Undergraduate	2016	MAT 001: 3x MAT 038: 3x FIS 065: 1x

Source: Research Data

As can be seen, both high and low academic performance students were chosen to participate in this stage. We tried to select students with contrasting profiles, as is the case of Lucca and Maurício. The former is a high-income student whose schooling was done entirely in a private institution of good reputation among the citizens of the city of Belo Horizonte and who has been achieving success in his performance in higher education. Mauricio, on the other hand, is a representative of the lower social classes, coming from public schools, and having failed several subjects in the first year of higher education.

Pedro, Aline and Fabrício, both from the middle class, do not present academic performance in higher education related to their school origins, as it is commonly expected[5]. The first two, despite never having studied in private schools, still perform well in the course. The last one, although he only studied in private institutions in elementary school and in a federal institute in high school, was held back in three of the five subjects classified as difficult in the first year. Thus, it was evaluated that the interview with students of different profiles would allow a greater richness of elements for investigation.

As already mentioned, this article analyzed the students' statements about their experiences in higher education and their perceptions about retention. When questioning the interviewed subjects about their experiences as students in higher education, aspects such as: transition from high school to university; study habits and strategies; motivation to study; involvement with curricular activities; feeling of integration at the university; negative experiences and frustrations; and perceptions about their professors' pedagogical practice were addressed.

Analyzing the process of transition from high school to college by the interviewed students, it is observed that the speech of student Lucca is significant to evidence a mistaken expectation that he and other college students in general have. At this moment of entry, according to Coulon (2008), there is an expectation that the same relationship with knowledge brought from school, in this case brought from high school, can be maintained in higher education:

> I was doing well in high school and underestimated the first exams here. Until I got less than 50% on the first two tests. Then I despaired. [...] You enter the course still

[5] This is not an in-depth sociological study of the educational and cultural conditions offered to each student, at the family or school level, nor a judgment of the quality of education in the schools attended by them. However, it takes into consideration the historical negligence of the state in relation to public basic education in general, which consequently tends to present lower results than the private education network (BRASIL, 2017).

> very immature. You keep going and going, and then you get scared? Even I got scared. The college rhythm is quite different from school. (Lucca)

When Lucca says in his speech "Even I was scared", he shows awareness of his privilege of having done his schooling in prestigious schools in the city, which did not prevent his transition to university from being marked by some "scares" in relation to the new way of relating to knowledge, of being charged and of being evaluated.

For some students, this initial "shock" shows the need to better prepare for the next evaluations, studying the taught contents daily, which according to the interviewees was not a common habit in high school. For others, however, the initial low performance leads to demotivation.

According to Lahire (1997), the investment made by each student in his or her studies is relative, so that some show greater motivation to study as a function of their school, cultural, material, and family backgrounds. Two out of the five interviewees, Lucca, and Pedro, claimed to be very motivated to study, because they like the content of the subjects. The others claimed that this motivation is linked to the nature of the subject, the pedagogical practice, and the relationship with their teachers. In their perceptions, content that relates to practical situations and teachers with whom they have good relationships and who teach better contribute to their enjoyment of going to class and more motivation to study. Aline's speech highlights these perceptions well:

> I didn't have much [pleasure in going to class] in Programming, because the professor wasn't particularly good. His class was just passing slides, and you just sit there and watch. But the others yes [...] Fundamentals of Mechanics, the teacher was very good, I liked her very much! (Aline)

> Some classes I just go to get attendance. Some teachers don't motivate you to attend their classes. [...] I really like the theory of Physics, but for those who want something more day to day I think it is very demotivating. For those who want a real test of physics. (Maurício)

Among the five students interviewed, two carried out scientific initiation activities (Lucca and Aline) and one was a PIBID scholar (Fabrício). In his speech, Fabrício, a daytime undergraduate student, highlights the participation in the program as crucial to his permanence in the undergraduate program:

> Now I am back to PIBID. I stayed for a year, then I spent six months just studying, and now I'm back to PIBID. [...] It was one of the things that kept me here the most, that made me not want to give up, quit the course and everything else. (Fabrício)

The students were asked if they could cite negative experiences in their student trajectories that could be related to the high retention rates in the course. In their answers, they mentioned: the lack of criteria in the distribution of grades, the "accelerated" teaching of the contents, textbooks with little explanation, little motivation for teaching on the part of

some teachers of the course, and overly dense curricula whose organization is not clear to everyone[6]. About the curriculum, Aline says

> I didn't know about that [the organization of the curriculum], I didn't have any orientation during the course about that. There are, for example, disciplines of the various groups that you must do to graduate, I didn't know that! I got to know about this a year ago. (Aline)

When talking about the pedagogical practices of their professors, the five subjects interviewed pointed out problems related to flaws in pedagogical practice, such as the lack of diversification in teaching methodologies and evaluations, with rare exceptions. One of these exceptions is represented by a teacher who is a follower of the Peer Instruction method, developed at Harvard University, USA. In his speech, Pedro remembers this teacher with satisfaction:

> He would hand out the contents in advance for you to read at home, and during the class he would just put questions on the transparencies. Then you had to hold up a piece of paper and say which was the right alternative. If more than 75% of the class got it right, he moved on to the next question. If not, he would give us some time to discuss among the students who got it right and understand why they gave that answer. And then he would ask it again. But it was the only subject that had something different. (Pedro)

The mentioned teacher, however, does not teach first-year subjects, the period in which subjects considered difficult are offered in the basic cycle. Such subjects undoubtedly require more attention in terms of pedagogical planning to teach them, due to the high abstraction of their contents.

To understand what the perceptions of students regarding the high retention rates in have been the first year of the course, it was considered important to analyze four dimensions: difficulty of the five first-year subjects; factors that cause retention; observed relationship between retention and course evasion; and finally, what could be done to reduce retention.

Among the five students interviewed, only one, Lucca, states that he did not perceive any difficulty in the courses focused on in this research. The others perceive them as difficult, although they believe that this is a relative difficulty. In their perceptions, these subjects are more difficult for students coming from public schools, even though they do not have extremely difficult contents. The students believe that high school did not prepare them for the level of complexity of the content of these subjects, which makes them difficult for some. The statements of Fabrício and Maurício below illustrate this perception:

> The content itself is not difficult. They are very innovative ideas and require a greater abstraction than what you normally had. And that's already a problem that I think is even from high school and not directly from college. [...] The problem for me is that they demand things that you should know, they believe that everyone has a strong preparation for this. (Fabrício)

[6] The curricular structure is available online on the course site for student access, although it is not so easy for a student who has just entered the university to understand.

> They are difficult. I don't believe that they are difficult, but because of the level that high school is now, if you only go out with a high school education for the subjects, they are difficult. (Maurício)

As for the factors responsible for the high retention rates in the first year of the course, problems of three orders were cited (COSTA et al, 2015): (a) **individual**, such as insufficient dedication to studies, immaturity when entering university, difficulty in the transition from high school to higher education, psychological and financial issues; (b) **structural**, such as the low quality of education received by some of the respondents in basic education and the lack of promotion of autonomy and study habits at this level of education; and (c) **contextual**, such as problems in the organization of the curriculum, the excess of subjects per semester, lack of didactics of its teachers, diversity in assessment instruments and study guidance, and distance in the relationship between some teachers and their students. The following statements illustrate some of the factors mentioned:

> The students arrive here unprepared [...] without knowing what it is to study! Without knowing what dedication really is. (Pedro)

> [...] the second time I took Calculus, the teacher was a little better, I managed to pass it. Programming... Besides being bad at programming, the teacher's method was awfully bad. [...] GAAL was more my negligence, really! I had to abandon GAAL to pass Calculus. (Maurício)

Regarding the observed relationship between retention and dropping out of the course, it was unanimous among the students the response that successive retentions are related to the will to drop out. In the students' words:

> Yes, in my class, for example, it was me and another student who managed to pass Calculus, who joined us. The other people who didn't make it, some continued in the course, but the majority, I think almost half of the class, left. So, I think this is very important, whether the student stays in the course or not. (Aline)

> Yes, for sure! I study with people who take the same course four or five times. So, some people end up getting depressed because of that, which is perfectly normal! [...] They get discouraged and give up because of this number of failures. (Pedro)

The interviews with the students were concluded with the following question: what in your perceptions could then be done to decrease the high retention rates in the first year of the course? The students suggested several interventions. Among them, the monitoring of a professional study guide, as well as a psychologist to help those who face greater difficulties in this regard. They emphasized the need to offer more support to students, especially those coming from the public school system. In their perceptions, it is necessary to teach them to seek knowledge and understand the organization of the curriculum, as well as to present new ways of studying and help in the process of affiliation to the university.

> Someone to talk to, to orient, a psychologist, I think that would help a lot those who have more difficulties, more problems. [...] More experienced veterans that had done well in the course could receive, talk to give some tips. [...] Professors meeting with the newcomers and explaining: "Look, the course is going to be like this, be careful with this." (Lucca)

> I think it could provide more support for students, especially those coming from public school high school. Because I lived through this, I didn't know how to study in college, and we must learn here, on the spot. So, you end up failing to try to adapt to college. You are there alone, individually, you have no support. At least me, I didn't have any support from a teacher, from any part of pedagogy, from Physics, you know? [I think it would help by teaching the students to

Students also emphasized the need for their professors to be prepared pedagogically for the exercise of teaching and stated that subjects such as "Pre-calculus[7]" and tutoring contribute to reducing retention.

Finally, the interviewees mentioned the importance of improving the preparation for university entrance, reinforcing the need to increase the quality of basic education, and rethinking the pedagogical methods adopted at this level, with a view to further developing the students' autonomy to study.

4 Final considerations

The present work allows, through the perceptions of the participants, to elucidate reasons for the high retention rate in the first year of graduation of a course with an equally high dropout rate. It was found that the transition of students from high school to college is a complex and sometimes painful process. The clash between the study, teaching, and assessment cultures of high school and higher education, among other factors, is an obstacle to academic integration in the first semesters of graduation and to learning the craft of being a student in higher education.

To justify the low performance and failures in the Physics course, the research subjects identified individual, structural, and contextual factors, highlighting the difficulties in overcoming this problem, whose solution is not easy, but is essential for increasing the quality of academic experiences. The perceptions raised point to the need for greater dialogue between students and teachers, as well as between both and the institution, to develop strategies to address retention in view of the high economic and social damage it causes.

Combating low academic performance and retention in higher education, especially in the first semesters of graduation, should be a fundamental focus of proposals, projects, and actions of university institutions. The development of an institutional pedagogical project focused on the first year of university can contribute to increase academic success in the Physics course and other undergraduate courses. It is necessary to shorten the passage between the three times that mark the student's entry into higher education, pointed out by Coulon (2017): strangeness, learning and affiliation. The first time can be reduced or smoothed out, the second needs to be accompanied and taught, and the last should not only occur in the final years of undergraduate study.

[7] The Pre-Calculus course was created to help students who had problems with mathematics content in high school and aims, as the name indicates, to prepare them for calculus courses. However, despite high retention rates in calculus, a professor of the course in question states that demand for it is still low.

It is known that Reuni expanded access to the university by increasing vacancies and, likewise, Law 12.711/12 (BRASIL, 2012) which allocates 50% of vacancies in universities and Federal Institutes for students coming from public schools favored access to higher education for young people from low-income families. However, problems faced by public high schools, such as the lack of properly qualified teachers to teach subjects like physics, chemistry, and mathematics, among other factors, pose a new reality for the university. Without assistance to these students - and even to those coming from private schools - access to higher education has been guaranteed, but not their permanence. Repetitions and dropouts make teaching more expensive and show that the opportunity to get in was really apparent, because admission without permanence is costly to the public coffers and to the students and their families, who see their expectations of a higher education course frustrated. Thus, the care taken with the first university year in pedagogical and institutional terms has its importance highlighted, especially in the context of expanding access to higher education. As Tinto and Engstrom (2008) rightly state: access without support is not opportunity.

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