Experience Report

Student Permanence in the Cederj Consortium Courses

Permanencia de los Alumnos en los Cursos del Consorcio Cederj

Permanência dos Alunos nos Cursos do Consórcio Cederj

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Abstract

The goal of the present study was to characterize the profile of the students when engaging in the undergraduate programs in CEDERJ, as well as the internal and external factors which correlate with their persistence in the programs. This study involves analyses of data from 53.988 students entering to 15 different programs during the period of 2008.1 to 2015.2. It was observed that the relationship of different factors with the persistence of students vary among different careers (except for age) indicating that career is a key factor to be considered when analyzing student persistence. Other factors that correlate with the persistence, besides the two above mentioned, are gender, family income, home distance to the students support centers (polo), proficiency in Portuguese language, previous experience with distant education based in print books and Information technology, previous graduation in other programs, basic education in public or private schools, and if the student works or not during the period attending the program. Based on the above results a methodology is proposed to identify different subgroups of students sharing same profile taking

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into account the career and the different factors - as well as the inter-relations among them - that correlate with persistence. We believe that these results could support institutional actions and strategies that better fits the specific problems of each subgroup in order to improve the persistence of students.

Keywords: Distance education. Dropout. Persistence. Course completion ratio. Undergraduate program. Cederj.

Resumen

El objetivo de este trabajo fue identificar las características de los alumnos en el momento del ingreso en los cursos superiores del Cederj así como sus factores externos e internos que tengan correlación con su permanencia en los cursos. Este estudio involucra análisis de informaciones sobre 53.988 alumnos que ingresaron en 15 cursos en el período de 2008.1 a 2015.2. Se observó que la relación entre los diferentes factores (con excepción de la edad) con la permanencia de los estudiantes varía con el curso, indicando que curso es un factor fundamental a ser considerado en los estudios de permanencia de alumnos. Otros factores que se correlacionan con la permanencia, además de los dos ya mencionados, son el sexo, los ingresos familiares, la distancia del hogar a el centro regional (polo), el dominio del idioma portugués, el grado previo en otro curso superior, la educación básica en la escuela pública o privada, la experiencia en EaD basado en material impreso y Tecnología de información, y si el estudiante trabaja o no mientras hace el curso. En base a estas observaciones se propone una metodología para identificar diferentes subgrupos de estudiantes con perfiles similares, teniendo en cuenta el curso y los diferentes factores (así como las interrelaciones entre ellos), que correlacionen con la persistencia. Creemos que estos resultados podrían basar acciones institucionales y estrategias más adecuadas a problemas específicos de cada subgrupo, pudiendo así aumentar la permanencia de los alumnos.

Palabras clave: Educación a distancia. Permanencia. Abandono. Taxa de diplomación. Curso pregrado. Cederj.

Resumo

O objetivo deste trabalho é identificar as características dos alunos no momento do ingresso nos cursos superiores do Cederj bem como seus fatores externos e internos que tenham correlação com sua permanência nos cursos. Este estudo envolve análise de informações sobre 53.988 alunos que ingressaram em 15 cursos no período de 2008.1 a 2015.2. Observou-se que a relação entre os diferentes fatores (com exceção da idade) com a permanência dos estudantes varia com o curso, indicando que curso é um fator fundamental a ser considerado nos estudos de permanência de alunos. Outros fatores que correlacionam com a permanência, além dos dois já citados, são gênero, renda familiar, distância de casa ao polo de atendimento presencial, domínio da língua portuguesa, graduação prévia em outro curso superior, educação básica em escola pública ou privada, experiência em EaD baseado em material impresso e Tecnologia de informação, e se o estudante trabalha ou não enquanto faz o curso. Baseado nestas observações propõe-se uma metodologia para identificar diferentes subgrupos de estudantes com perfis similares, levando em conta o curso e os diferentes fatores (bem como as interrelações entre eles), que correlacionem com a persistência. Acreditamos que estes resultados poderiam embasar ações institucionais e estratégias mais adequadas a problemas específicos de cada subgrupo podendo assim aumentar a permanência dos alunos.

Palavras-chave: Educação a distância. Permanência. Evasão. Percentual de diplomação. Curso superior. Cederj.

1. Introduction

The evasion of students in higher education is an important issue for educational institutions and for students themselves. Therefore, it has been a concern for directors and managers of higher education institutions (HEI). Thus, factors that may influence permanence and consequent graduation of students or dropout have been the subject of research for many decades, with different approaches and methodologies in different systems, such as (Cookson, 1990, Martinez, & Munday,

1998, Parker, 1999, Park, 2002, Xenos, Pierrakeas & Pintelas, 2002, Barefoot, 2004, Packham, Jones, Miller & Thomas, 2004, Willging & Johnson, 2004, Fozdar, Kumar & Kannan, 2006, Simpson, 2006 e 2013 Tyler-Smith, 2006, Park & Choi, 2009, Patterson & McFadden, 2009, Lee, Choi & Kim, 2013, Bentes & Kato, 2014, Guimarães, 2017).

Theoretical models based on empirical work has been proposed to study factors that lead students to give up or stay in a course; one of the most cited factor is the Tinto model (1975, 1987, and 1993), which values interactions between the student and the educational environment offered by the course. According to this model, social, and academic integration are factors that lead to a greater commitment of the student to the institution, resulting in its permanence in the course.

With the increase of the offer of distance courses, it was observed that evasion is even greater in this modality. This is also the case with the undergraduate courses of Cederj Consortium (Bielschowsky & Masuda, 2018). The Tinto model was developed based on studies on permanence and evasion in face-to-face courses taking into account aspects specific to this teaching modality. The students' characteristics are different: students of classroom courses are usually young graduates from high school who do not work and study full time; in turn, the typical student of distance courses is adult, with more than 24 years, works full time and studies part time, is referred in the literature as nontraditional student. Thus, it was realized that models to understand evasion/permanence like those of Tinto were not totally adequate for Distance learning (EaD), resulting in proposals of new models that incorporated peculiar aspects of Distance Education. One of these is the one proposed by Bean & Metzner (1985); based on empirical studies about factors that affect distance learning, incorporated new elements into the Tinto model: academic performance, personal characteristics, knowledge acquired before entering the course, and variables surrounding the student. These authors propose that the main difference between the traditional student and the Distance Education student is that the latter would be more sensitive to factors in their environment.

Rovai (2003) proposed a model of persistence (Composite Persistence Model) in which he tried to synthesize several factors, including many

of the factors present in Tinto and Bean & Metzner (1985) and incorporating additional factors related to the specificities of the Distance Education methodology and the most frequent profiles of Distance Education students. Thus, it identified four groups of factors that influence permanence of student in a distance course: defined factors before joining: 1. Pre-admission individual characteristics of the student, such as age, ethnicity, gender, whether or not he/she is working; 2. Pre-admission student skills, such as computer literacy, written and reading language literacy, computer-based interaction; and post-admission factors: 3. External factors, such as financial status, employment, family responsibility, encouragement by family to do the course, problems/accidents and others; 4. Internal factors such as academic integration, social integration, identification and commitment to its objectives in choosing the course, feeling of belonging to the institution (Tinto, 1975, 1987, and 1993), study habits, program and schedule suitability, pedagogical design, access to the infrastructure provided by the institution/course, pedagogy of the course. This model has been widely used and at the same time rediscussed in some details; in order to systematize this work, we will base ourselves on Rovai's model.

This work aims at analyzing the characteristics of the students who entered Cederj over eight years, between 2008 and 2015, in order to identify which characteristics are correlated with the permanence and graduation of these students. The main objective is to guide actions that seek greater adherence of our students.

To do so, we studied the trajectory of about 54 thousand Cederj Consortium students who entered between 2008 and 2015 in fifteen undergraduate courses, selected according to methodology that will be discussed in the second section. We relate permanence and evasion to several factors included in three of the four dimensions of the Rovai model: external factors, characteristics and previous skills of the student.

Since this study was carried out in the data universe of Cederj Consortium students, the following is a brief description of this consortium. Cederj (Bielschowsky, 2017) was initially composed of the following higher education institutions: Universidade do Estado do Rio de Janeiro – UERJ; Universidade Estadual do Norte Fluminense Darcy

Ribeiro – UENF; Universidade Federal do Estado do Rio de Janeiro – UNIRIO; Universidade Federal do Rio de Janeiro – UFRJ; Universidade Federal Fluminense – UFF; Universidade Federal Rural do Rio de Janeiro – UFRRJ. Subsequently, other public HEIs of Rio de Janeiro were added to the consortium; the Centro Federal de Educação Tecnológica Celso Suckow da Fonseca (Federal Center for Technological Education Celso Suckow da Fonseca - Cefet-RJ) have been offering undergraduate courses since 2012.

Courses were offered since 2001, with a degree in education in Mathematics by UFF, initially with only 160 students distributed in four regional centers: Itaperuna, Paracambi, São Fidelis, and Três Rios. Currently, there are 43,559 active students in the 32 regional centers covering all regions of the State of Rio de Janeiro enrolled in sixteen courses that include the following courses: bachelor's degree in education in Biological Sciences, Physics, Geography, History, Language Studies, Mathematics, Pedagogy, Chemistry, and Tourism; bachelor's degrees in Administration, Public Administration, Production Engineering, and Accounting Sciences, the latter beginning in the second half of 2018; and technology courses in Tourism Management, Public, and Social Security, and Computer Systems. This set of careers unfolds in about 660 disciplines, which are shared between different courses.

The Cederj consortium is financed by the government of the State of Rio de Janeiro (about 45%), by the Federal Government through the Brazilian Open University program of Capes/MEC (45%), and the rest is up to the municipalities that host the regional centers. These centers provides students with didactic laboratories, a library, school office and 2-hour face-to-face mentoring for all disciplines of the first two years. It also offers distance learning in VLE(moodle) for all disciplines and other elements typical of this environment. Two face-to-face tests (80% weigh) and two distance assessments (20% weight for each subject) are carried out, and also a third face-to-face if students have not reached an average of 6.0 in these assessments.

An important guiding factor in the construction of Cederj Consortium was to offer courses in the distance modality with the same quality of courses offered in the face-to-face modality by the

consortium universities, which are among the best rated by INEP, through the National Student Assessment Examination (Enade) (Inep, 2017). To this end, courses and disciplines are coordinated by university professors with recognized research performance in their areas of activity. Ensuring quality in distance learning courses implies, among other things, comprehensive content and dense and rigorous assessment of learning, themes that may hold strong relation to the question of permanence.

The second section presents the methodology adopted in the present work and its main results. The third section presents and discusses the main results of this work; in particular we show that some important and consensual conclusions of previous studies are not echoed in the present research. In the fourth section we present a methodology to work on the different parameters highlighted by Rovai, aiming at actions that favor greater adherence to the courses in Distance Education. We present our final considerations in the fifth section.

2. Methodology

In the present work, we analyze the relationship between the percentage of permanence of students and several factors: the course itself, socio-demographic, and economic data, type of high school institution, admission examination grades and engagement with professional work, among others. We first present some methodological aspects:

2.1. "Non-students"

In previous work (Bielschowsky & Masuda, 2018), we defined the concept of "non-students", as those who do not take the first face-to-face assessment (AP1) of any of the subjects in which they are enrolled in the semester of admission into the course. AP1 occurs approximately two months after the start of the course. These "non-students" are not included in the present research, since they do not perform academic acts and, in most of the cases, do not enroll in disciplines for four subsequent semesters, causing their enrollment to be canceled.

2.2. Restricting current search for enrollments made between 2008.1 and 2015.2

Although Cederj Consortium started its offer in 2001, only as of the 2008.1 semester did we collect more complete information on the socioeconomic profile that is important in the present study. We also considered it appropriate to not include in this research students who have recently joined, since in the first two years of the course there is a lot of student movement, between active, withdrawn and canceled. For this reason we restrict this research to incoming students between 2008.1 and 2015.2. With this restriction, we reduced the universe of this research from 121,016 to 75,370 enrollments. Of these, 21,382 are the "non-students" defined above taking the research universe to 53,988 students.

2.3. As we consider permanence (P) and dropout (D)

In the academic record of Cederj Consortium students, student status is classified as:

  a. Active

  b. Graduated

  c. Canceled

  d. Automatic withdrawal

  e. Withdrawal upon request

In dropout, we consider as "canceled students" and those in automatic withdrawal, this status includes those who are not enrolled in any discipline and who, after four semesters, have their enrollment canceled ("non-students" represent approximately 16% of enrollments). In permanence, we consider active, graduates and withdrawn on request students, which represent 1.5% of enrollments, removing "non-students", that is:

  • P = Permanence = Active + Graduates + Withdrawal upon request (1,5%)

  • D = Dropout = Canceled + Automatic withdrawal (15.7%)

2.4. Beginning of courses

We started the degree in education in Mathematics (UFF) in 2001, followed by the degree in Biological Sciences (UFRJ and UENF) and other courses. We continue to create careers; for example, we are starting in 2018.2 to 16th career of Accounting Sciences, offered by UFRJ. In addition, each course is offered only in part of the existing regional centers and has different number of vacancies. As a consequence, the number of students enrolled per course differs. Table 1 shows the universe of enrollments by course and composition by gender.

Table 1: Universe of students approached in this work

Courses	Fem.	Male	% Fem.	Total
Bachelor's Degree				
BUSINESS	2,647	3,230	45.04	5,877
PUBLIC ADMINISTRATION	1,298	1,746	42.64	3,044
PRODUCTION ENGINEERING	134	312	30.04	446
Bachelor's degree in education				
LIFE SCIENCES	5,768	2,411	70.52	8,179
PHYSICS	478	1,634	22.63	2,112
GEOGRAPHY	459	542	45.85	1,001
HISTORY	887	1,267	41.18	2,154
LANGUAGE STUDIES	1,152	387	74.85	1,539
PEDAGOGY	9,788	1,412	87.39	11,200
MATHEMATICS	2,775	4,299	39.23	7,074
CHEMISTRY	688	462	59.83	1,150
TOURISM	1,257	760	62.32	2,017

Technologist Courses				
PUBLIC AND SOCIAL SECURITY TECHNOLOGY	266	1,663	13.79	1,929
TOURISM MANAGEMENT TECHNOLOGY	674	476	58.61	1,150
COMPUTER SYSTEMS TECHNOLOGY	787	4,329	15.38	5,116
OVERALL TOTAL	**29,058**	**24,930**	**53.82**	**53,988**

The Pedagogy course has the largest number of students - more than 11,000, followed by Biology (8,179) and Mathematics (7,074). Production Engineering has the lowest number of students, 446; and was created last. It is verified that, taken globally, gender balance exists, with approximately 54% women. However, this distribution varies greatly across courses, with a strong presence (difference of 10% or more) o women in four courses: Biology, Language Studies, Pedagogy, and Tourism and men in five courses: Computing, Production Engineering, Physics, Mathematics, and Public and Social Security.

2.5. Variables considered

This paper addresses three of the four dimensions suggested by Rovai: students' personal characteristics, students' abilities at the time of admission and its external factors, such as work and family responsibility of 53,998 students. Data were extracted from Cederj Academic Records System, from the grades of different entrance exams and 22 information included in the socioeconomic questionnaire applied in the admission exam, totaling 130 different records for each student. Of this total, for different reasons, we do not have information from the socioeconomic questionnaire applied in the admission of 13,346 students.

The final universe surveyed makes up about 6.7 million records; we initially sought to select information that has a reasonable relation to permanence, discarding those that did not impact this variable. In data processing, we used the Tableau software (Tableau 2018)

3. Results

3.1. Dependency of permanence x career

In an earlier study (Bielschowsky & Masuda, 2017), we used the data from the National Institute of Education and Research Anísio Teixeira (Inep) to show that the strong dependence on adherence to the career is a general characteristic of higher education in Brazil, regardless of modality. This dependence on career graduation – hence permanence – is an important parameter in the analysis of the results of this study. Figure 1 shows the overall percentages of Permanence per career.
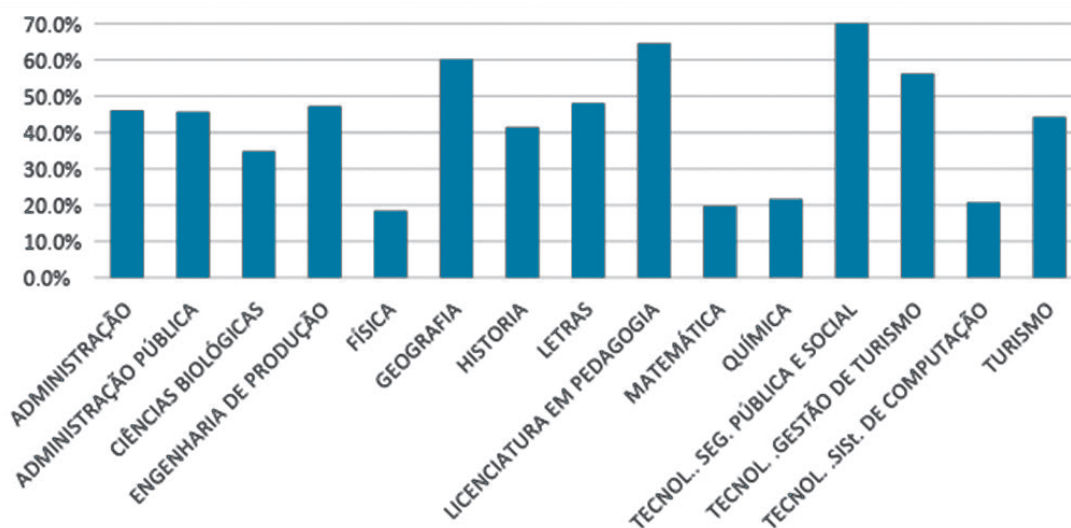
Figure 1: Permanence index, by career

Figure 1 shows great differences between the percentages of permanence across careers. For example, while Pedagogy and Public Safety have permanence percentages of near 70%, Computing Systems, Physics, Mathematics, and Chemistry are around 20%.

It is worth remembering that permanence does not necessarily lead to graduation, since it also considers active students.

3.2. Dependence of permanence with personal characteristics of students and external factors at the moment of admission

3.2.1. Dependence with age and time after high school

Figure 2 shows the percentage of permanence due to age at the time of admission. It is verified that the age factor has great influence on permanence, increasing almost linearly until about 35-37 years. From that age, influence becomes smaller, showing even a trend to decrease permanence with ages from 45-50 years.
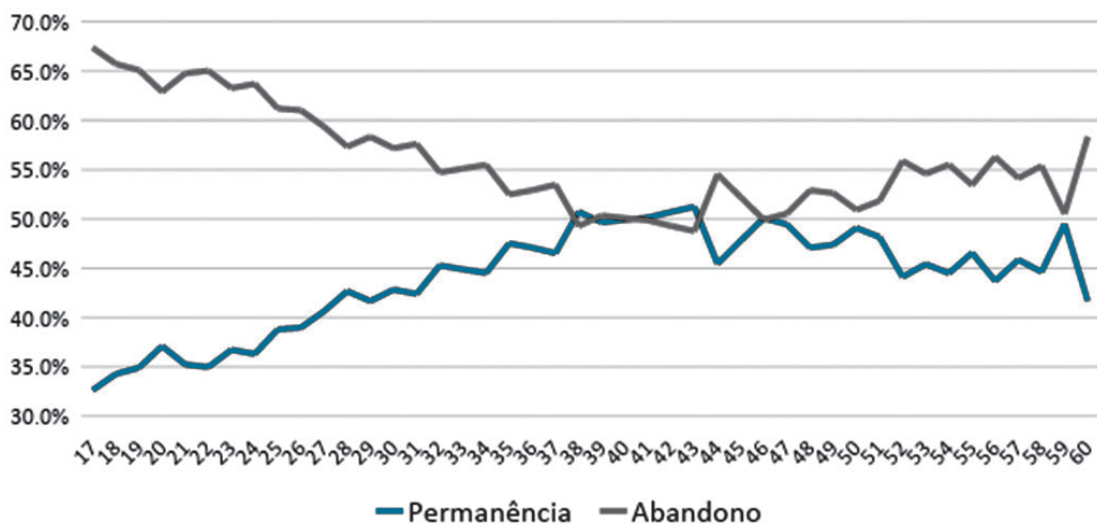

Figure 2: Permanence in function of age at admission
Note: The data used are shown in Table 1 of the Annex.

Figure 3 shows that about one-third of students are under 22 years old; this is the age group that corresponds to the lowest permanence rates (Figure 2).
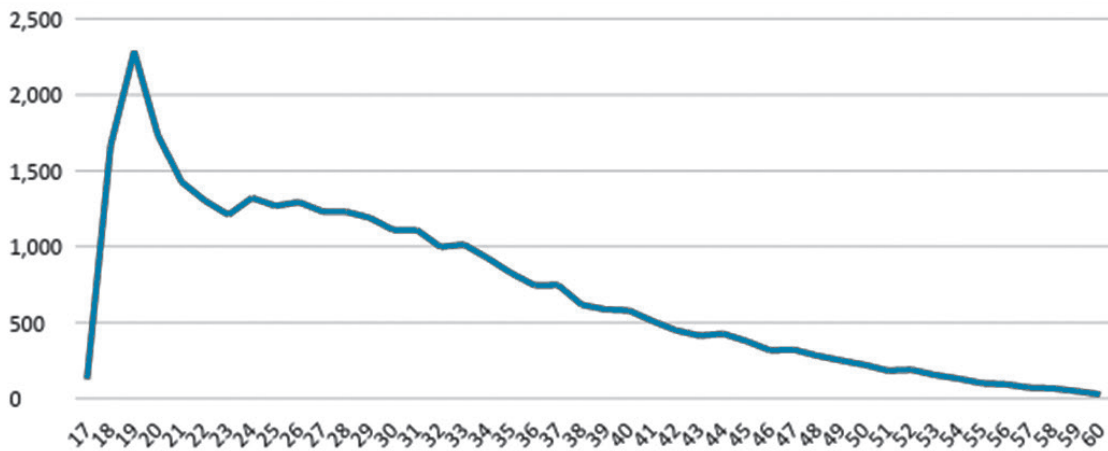
Figure 3: Number of students per age at time of admission

We also investigated whether this permanence behavior with age was repeated in different careers; we obtained similar behavior in all of them. The observed relationship between permanence and the student's age can result from a combination of two factors: maturity tends to favor adherence to the courses, but also means a longer time between the completion of high school and admission into Cederj, that is, content learned and study habit, at first, would be less present in older students. Does the time the student remain without studying influence his/her adherence to the courses? Figure 4 shows the percentage of permanence as a function of time between completion of high school and admission into Cederj.
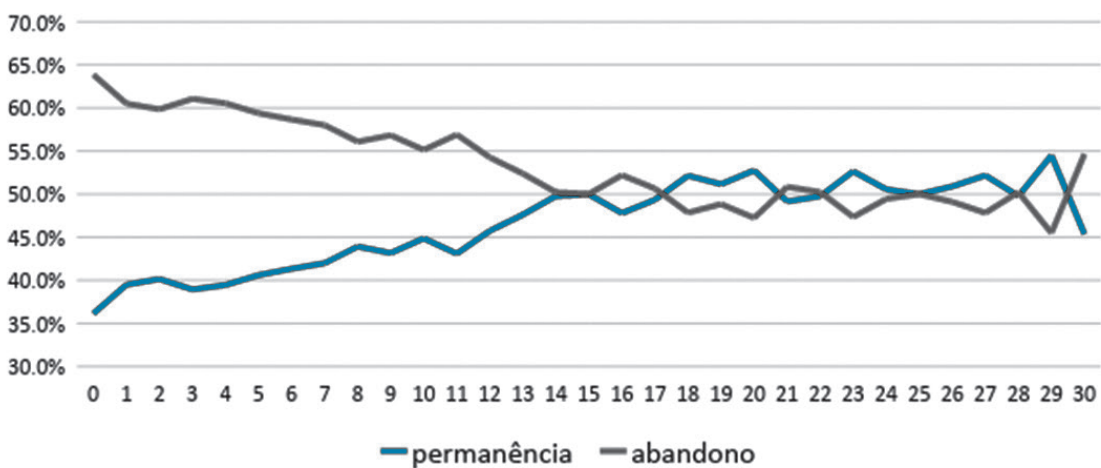
Figure 4: Permanence × number of years between completion of high school and admission into Cederj

It is observed in Figure 4 that, for those who finished high school for more than 14 years, the time left unattended does not interfere with the permanence. On the other hand, those who completed high school less than 14 years ago, many of whom are probably in the 17-22 age bracket (Figure 3), have a shorter stay; the percentage of permanence is lower, the more recent the completion of high school. It should be noted that in this range, the curve is parallel to the Permanence curve as a function of age (Figure 2), reflecting the effect of age.

3.2.2. Dependence on gender

Another factor with a strong relation to permanence is gender. Figure 5 shows permanence according to age and gender.
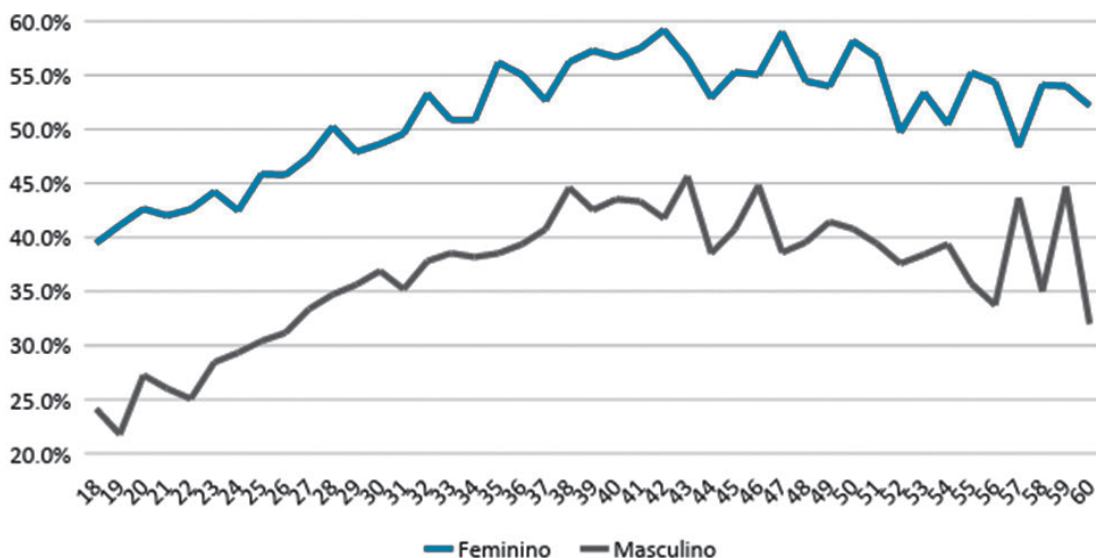
Figure 5: Permanence × gender and age

It turns out that, in an overall analysis of all students of all careers, women adhere more to courses than men at all ages. But, is this true for all courses? Figure 6 shows the percentages of permanence separated by gender for each course.
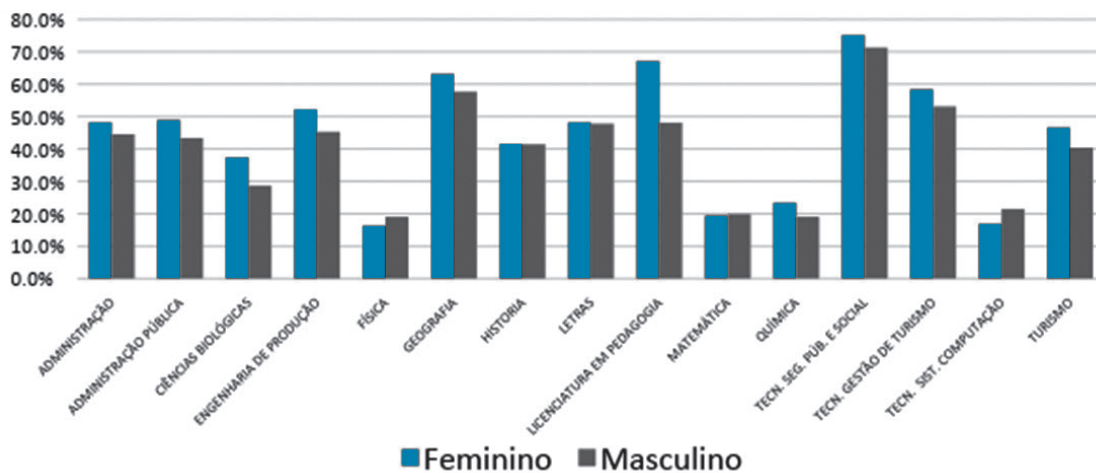
Figure 6: Permanence as a function of gender for each course*.
*Data used is shown in Table 2 of the Annex.

It can be seen that, unlike that observed in an overall analysis (Figure 5), the analysis by course is complex. Although in most Cederj courses there is a trend towards greater permanence of the female gender, only in the course of Pedagogy this difference between genders was significant in favor of women. In two courses, Computing Systems and Physics, the situation is reversed, as men show greater permanence. In three courses, Mathematics, History, and Language Studies, there was no difference between genders. Thus, the significant difference in the permanence among the genders shown in Figure 6 is probably a consequence of the large number of students in the Pedagogy course in Cederj, where there is a large predominance of women, as can be seen in Table 2 of the Annex.

3.2.3. Permanence x family income

Figure 7 shows the permanence as a function of family income, considering the totality of the courses.
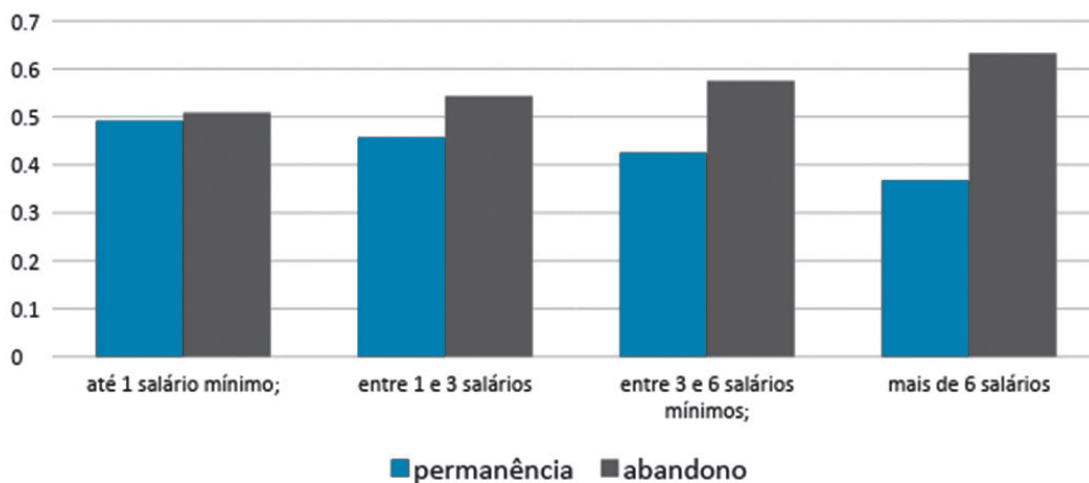
Figure 7: Permanence due to family income on admission

It is observed that the lower the income, the higher the permanence percentage. But, is this true for all courses? Figure 8 shows this relationship for each course.
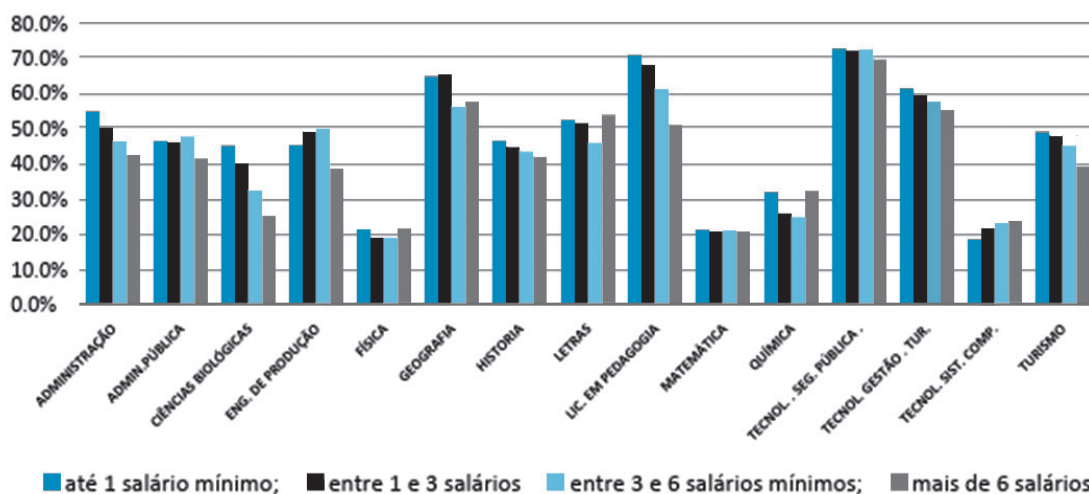

Figura 8: Permanência × renda familiar por curso*
*Os dados utilizados estão na Tabela 3 do Anexo.

We can observe that, in general: the lower the income the greater the permanence; but there are exceptions, such as Computing Systems, which follow an inverse trajectory – the higher the income the higher the permanence – and others which seems to be little related, such as Physics, Mathematics, and Public and Social Security. In the latter, there is an important peculiarity that deserves to be highlighted: this course

only accepts professionals of the area of public security in service in public institutions; 80% of vacancies are intended to professionals of the Military and Civil Police of the State of Rio de Janeiro. With this, their students form a more homogeneous group from the socioeconomic point of view and with higher family income, when compared to the other courses.

Table 3 of the Annex presents the gross permanence data related to family income and to the course.

3.2.4. Permanence x distance from residence to support center

Figure 9 shows how permanence in relation to time spent by the student to reach the center (measured by the time spent by the student to reach the center) varies, divided into four age groups. We consider this important fact for the question of permanence, since the Cederj model offers support to students in the form of weekly face-to-face mentoring at the centers for all subjects in the first two years of the course, even though it is not compulsory.

This face-to-face mentoring in conjunction with the VLE resources in the first half of the course facilitates the transition from a face-to-face education model that students used in elementary education to a distance-learning model with primary VLE support that they use in the second half of course.
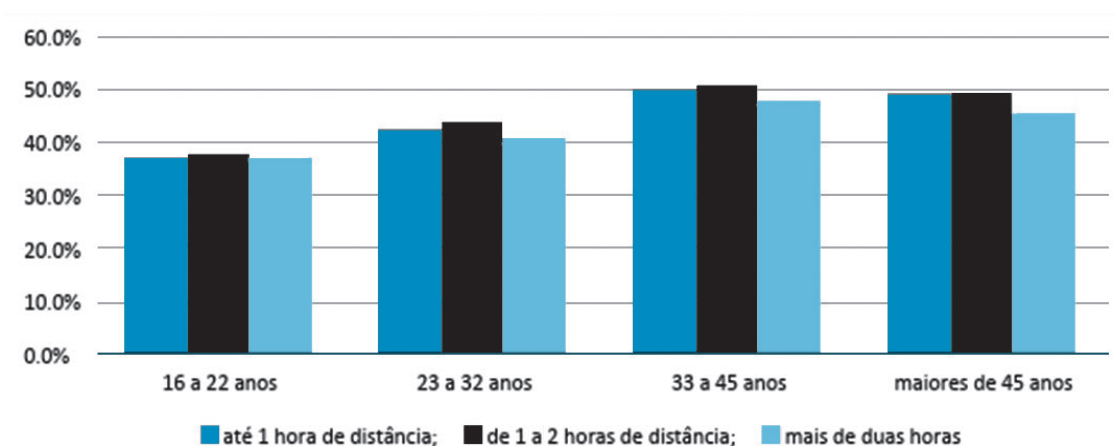

Figure 9: Permanence × age range and distance to the support center

It is interesting to note that distance weighs more for older students. While for the age range of 16 to 22 years we did not observe difference in permanence as a function of distance to the center, students over 45 years who live more than two hours away from the center remain on an average of 4% less than those who live closer the support center.

3.2.5. Permanence x other higher education courses

As a way of accessing knowledge and skills at the moment of admission, we compared permanence among students who never tried another higher education course and those who started without completing or had completed another course at the time of joining Cederj Consortium.

Figure 10: Permanence x other higher education courses at the time of admission

The figure shows that the permanence of students who were studying or had completed a course from the time of admission to Cederj (the last two columns on the right) is smaller than that of other students and probably due to different factors such as motivation to carry out another higher education course, dense content like those of Cederj, having already concluded or concluding another course. This result also suggests that prior knowledge (in this case, supposed to be substantial for those who have completed another higher education course) are not a prominent feature for permanence.

3.2.6. Permanence x type of basic education institution

Still in terms of knowledge and skills at the time of admission, there is much talk about deficiencies in the Brazilian public basic education system in general, according to the results of several official evaluation systems, such as the Enem (National High School Examination), Saerj (Evaluation System of Basic Education of Rio de Janeiro) and others. In the same vein, there is a strong questioning regarding the quota system for public school students to enter higher education. Figure 11 is a positive response, also in the case of Distance Education, to a question that has been widely discussed: will quota students from public schools be able to graduate?
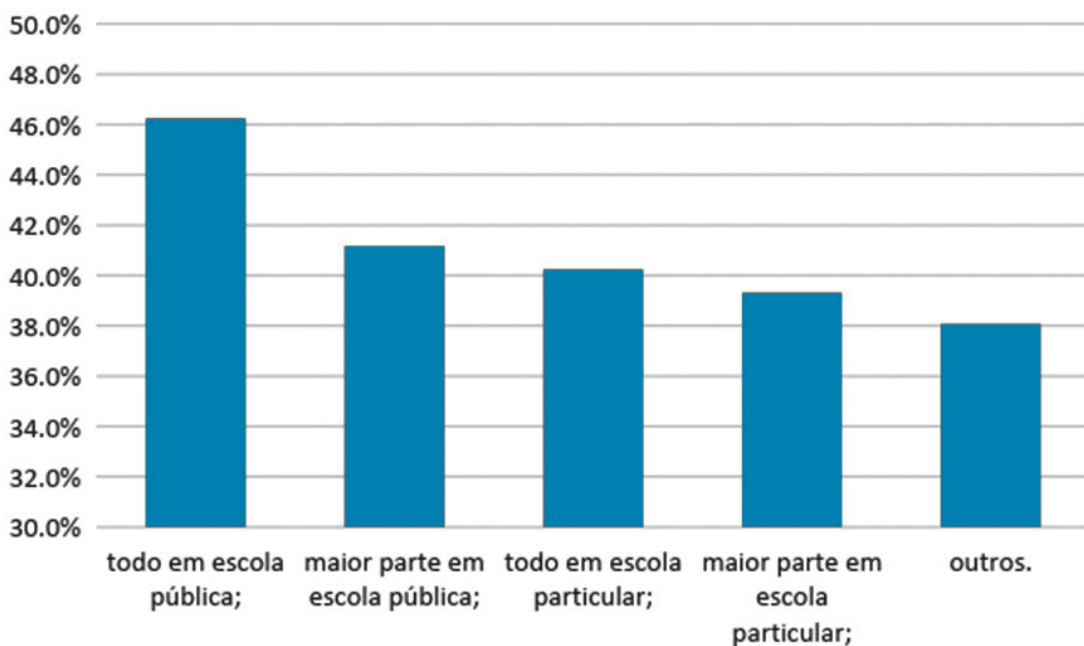

Figure 11: Permanence × type of high school institution

The answer to this question seems to be yes, as Figure 11 shows that students who attended all elementary school in public schools have a 6% longer stay than those who have completed all their elementary education in private school, and shows a similar characteristic with the analysis by family income. It is also worth mentioning that Cederj students had an Enade performance equivalent to that of the students of face-to-face courses in all courses, which can be seen from the results of 2015 and 2016 that Inep started to offer separated by modality (INEP

Enade 2015 and 2016) as well as in previous years through the results by course to which Universities that make up the consortium have access through its academic systems.

Regarding the question of comparing the performance of Distance learning students with their success rate in relation to the permanence percentage and grades obtained at the end of the course, in a report by Xu and Jaggars (2013) involving students from 34 community and technical colleges in the state of Washington, United States) enrolled in 2004, during 9.5 semesters and a total of 498,613 subjects attended by 41,227 students, it was verified that, globally speaking, the performance of students in Distance Education was significantly lower than face-to-face students in both questions (both in permanence as in performance), considering the grades obtained in the disciplines. In the case of Cederj, the permanence percentage is lower than that of face-to-face courses - globally, a 70-75% diploma in distance education compared to face-to-face (Bielschowsky & Masuda, 2017) – but with regard to the performance of graduates, expressed by their grades in Enade (two Enades for most of the courses in the period), this result differs in a study by Xu and Jaggars (2013): Cederj students achieved performance levels similar to those of the students of the in-person courses of the same institutions.

3.2.7. Permanence x work while studying

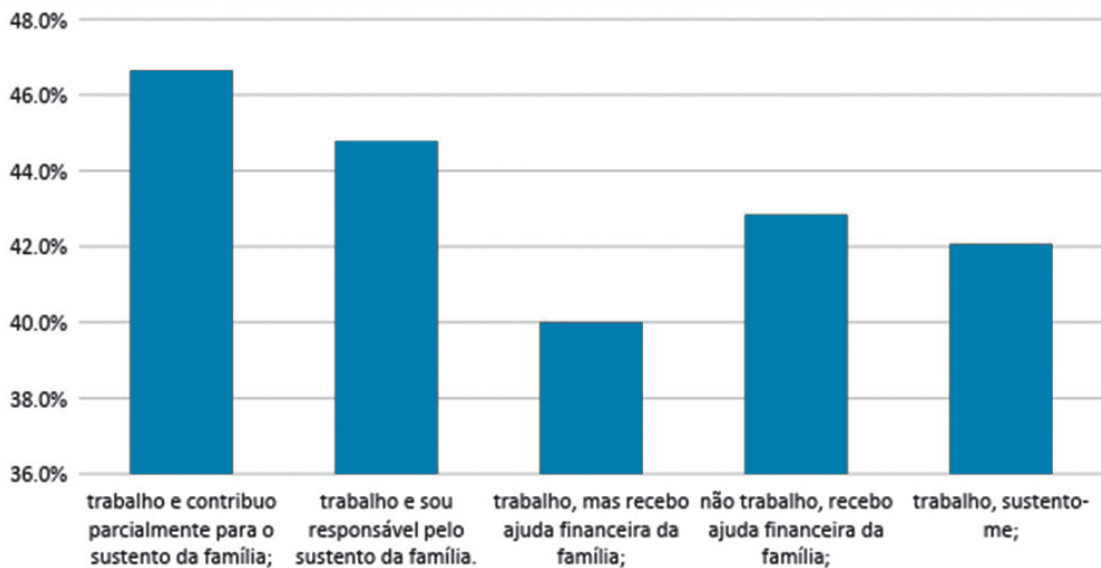Another element that has been much discussed is whether working students can graduate in higher education.

Figure 12: Permanence × professional work

Figure 12, in an overall analysis of all students, shows that the work does not negatively correlate with permanence; on the contrary: those who work and support their families have greater adherence to the system than those who do not work. This would be a surprising result, since our courses require a lot of dedication. To deepen this approach, we separated students into four age groups, as shown in Figure 13.
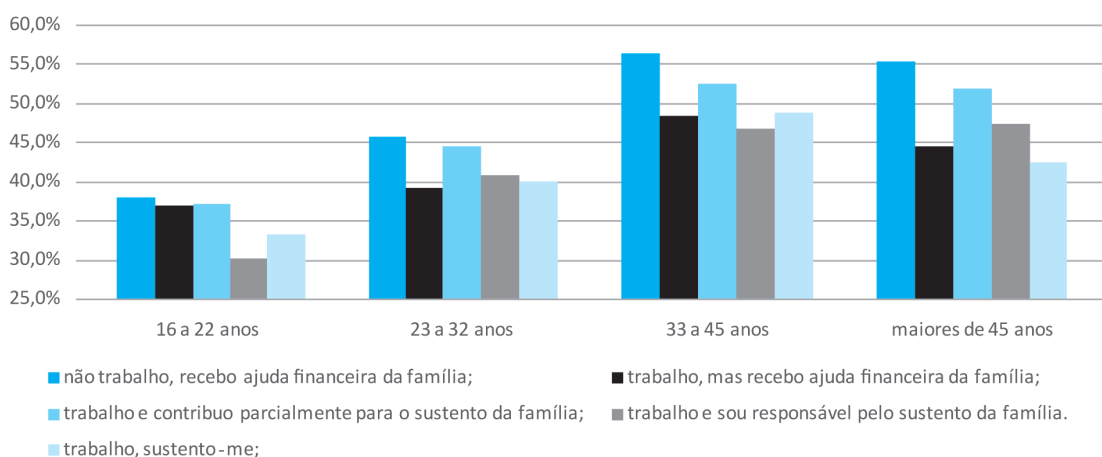

Figure 13: Permanence × work and age range

We find a completely different picture; among those who work and study, permanence is lower than among those who do not work. This

result corroborates what has been published on the subject, since in the vast bibliography with empirical research studying the reasons that lead to evasion, work-related demands have been pointed out as an important factor.

It is particularly interesting to compare students who seemingly have no family responsibilities and do not work with those who work, support themselves, and apparently also without responsibility for the family's support, thus isolating the effect of work. Table 2 shows the mean percentage differences by age group, comparing the permanences between those students who do not work and those who work and support themselves, both with no responsibility to support their families. In all age groups, the fact of working and studying decreases the percentage of permanence; the difference increases with age.

Table 2: Permanence in relation to work

	Difference in permanence among those who do not work in relation to those who work and support themselves without family responsibilities
from 16 to 22 years	4,6%
from 23 to 32 years	5,8%
from 33 to 45 years	7,4%
over 45 years	12,8%

These are striking results, which deserve greater detail and show the importance of social protection programs for disadvantaged students, such as permanent scholarships, if the program is to meet its social objective in a comprehensive way.

3.2.8. Permanence x access to computer and the Internet

With the prospect of seeking greater equality in access to knowledge and the university, it is important to see that our original instructional design, which adds information technology (IT) resources (in the Moodle platform and by mobile access) and traditional resources such

as printed material and mentoring, influences students' permanence. Figure 14 shows the percentage of permanence of groups with different levels of computer ownership and access to the Internet.
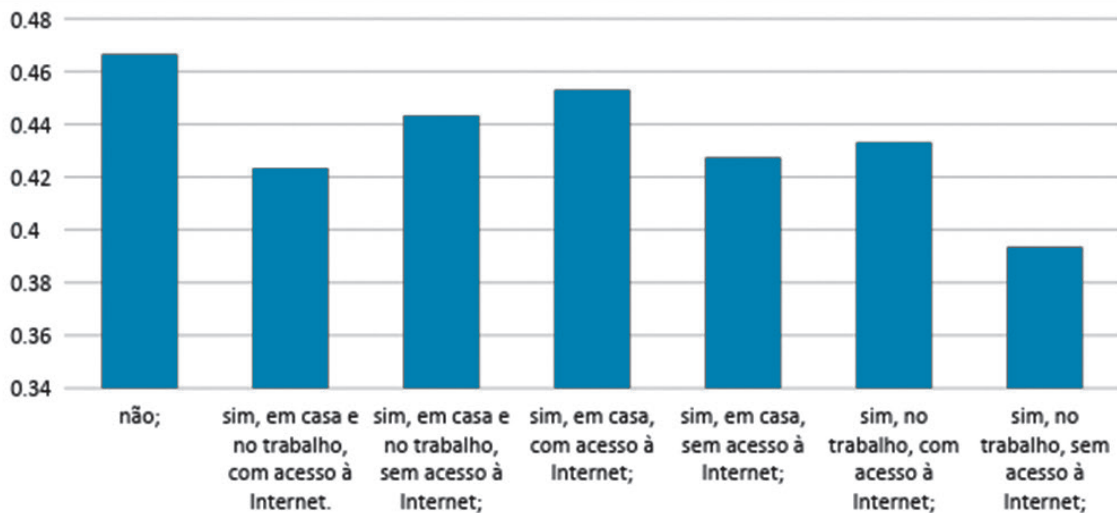

Figure 14: Permanence in relation to access to computer resources

Apparently, there is no direct relation between permanence and Internet access; the results preliminarily indicate that the original Cederj design allows the successful participation of students who do not have access to computer resources.

3.3. Permanence x skills acquired prior to admission

3.3.1. Permanence x Distance learning related skills

Figure 15 shows percentages of permanence in groups with different previous experiences in Distance learning.
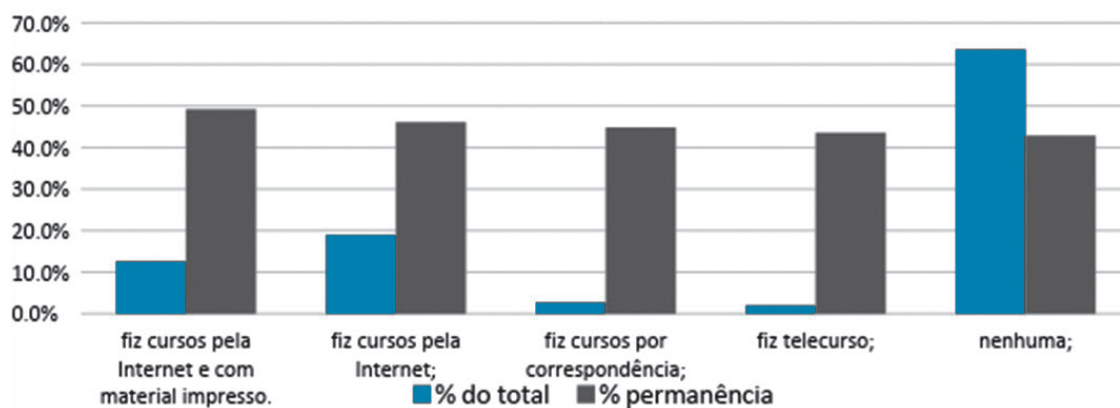
Figure 15: Permanence × previous experience of in Distance Education

It is important to note that the 13% of students who previously took courses using the Internet and printed material (the first orange column on the left) were 8% higher than those who had no prior experience with Distance Education (Distance learning) (last column on the right), despite of the offer of a compulsory discipline in the first semester of all the courses aiming to train new students in this technology. In a study that aimed to evaluate the adaptability to Distance Education (Distance learning), Xu and Jaggars (2013) observed that students in some courses as computer science were more easily adapted to the Distance Education, possibly due to the specificities of the course area and/or students profile, for whom technology was not a barrier. But, other factors may be involved.

3.3.2. Permanence x specific knowledge on admission

As the entrance of the majority of the students is done by the entrance exam of Cederj Consortium, we analyze the relationship between the student's permanence and their knowledge at the time of admission, as measured by the entrance exam. In the period covered in this study, Cederj entrance exam consisted of a one-day test, composed of two parts: one of general knowledge, with 40 multiple-choice questions covering eight areas of knowledge: Portuguese (Portuguese Language and Brazilian Literature), Mathematics, History, Geography, Biology, Chemistry, Physics and one Foreign Language, with five questions for each area. The second part was specific discursive proof, with questions of the specific area (s) defined by the coordination of each course, and a

writing test. The passing criterion was a non-zero grade in the multiple-choice test, the writing test, and the specific discursive test.

Among all the previous knowledge related to permanence, the most relevant, by far, are those related to the Portuguese language, which can be obtained by the grades of the entrance exam in essay and the Portuguese Language questions.

Figure 16 shows the relationship between permanence and grade of students writing in all courses.
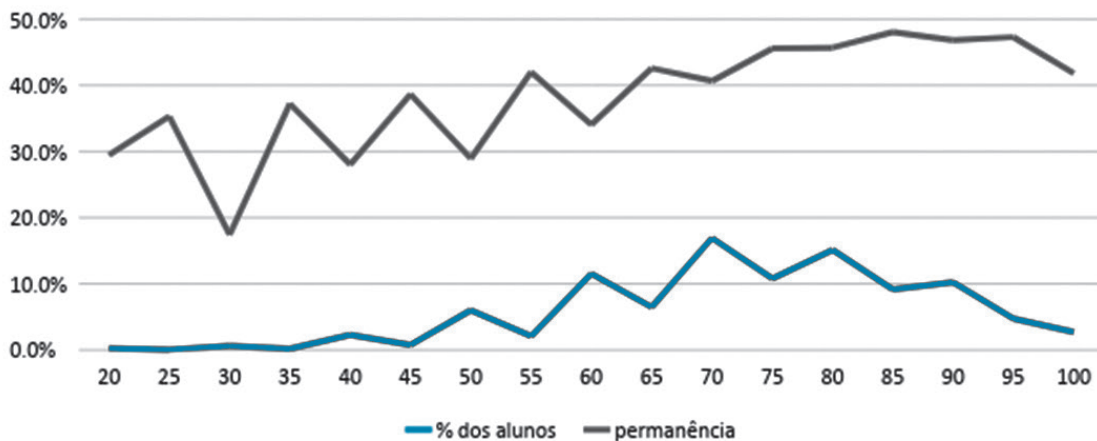

Figure 16: Permanence × admission exam grade*
*The data used are shown in Table 4 of the Annex.

The difference in permanence between those who scored 80 in the essay and those who took 40 marks is 18%, which shows unequivocally the importance of having acquired Portuguese language mastery in high school in order to achieve success in higher education course of Cederj.

Does the relationship between permanence and proficiency in Portuguese vary with age at the time of admission? To figure this out, Figure 17 separates students by age range.
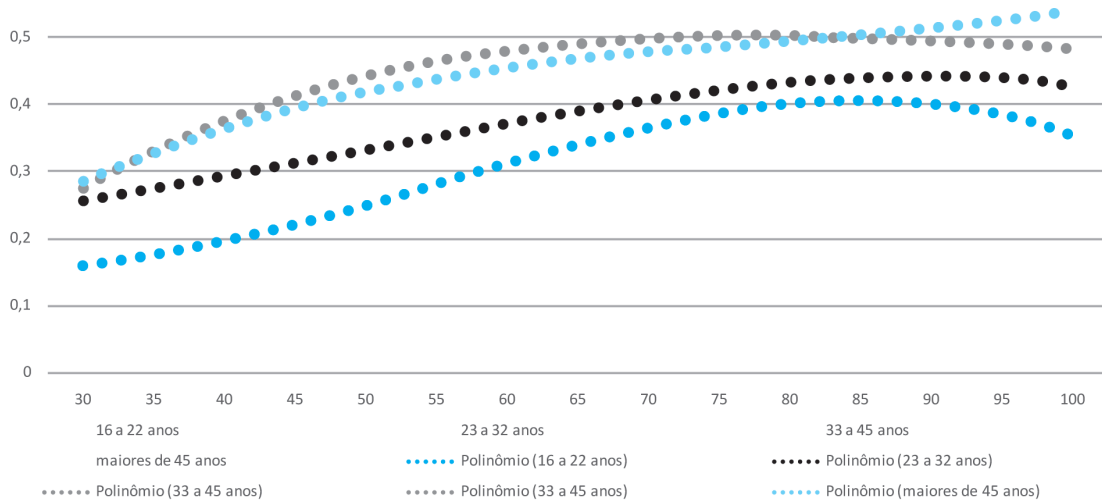
Figure 17: Permanence × writing grade by age group

Figure 17 shows that young students entering with little proficiency in writing have very low chances of success, pointing to the shortcomings of basic education particularly in what concerns the reading and comprehension of texts. The drop in permanence among students with higher grades observed in the younger age group may result from the option of these students for face-to-face courses. A similar picture was observed when we evaluated the relation between permanence and grades of the multiple choice questions of Portuguese Language.

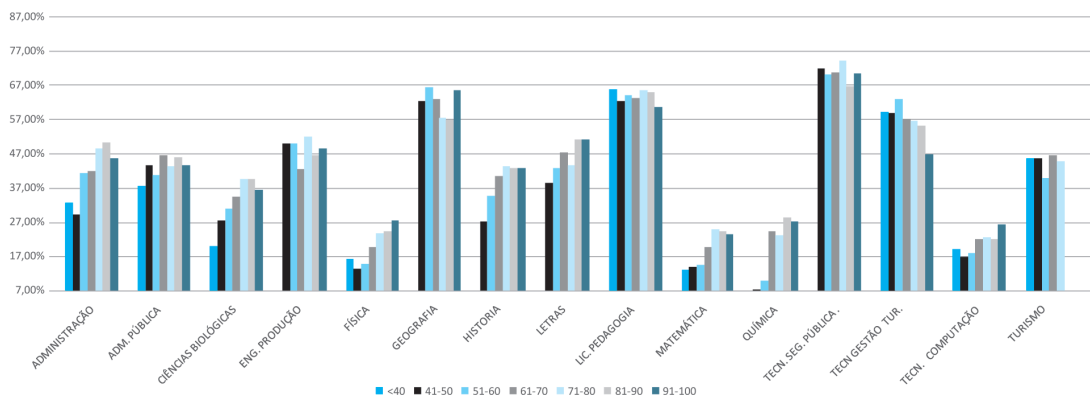Is this relationship of permanence with proficiency in the Portuguese language observed in all careers?

Figure 18: Permanence × writing grade on admission by career

We can see that, once again, the situation is more complex when separated by career. Although there are careers such as Management, Biology, Language Studies, Physics, and History that corroborate the direct relationship between the writing grade and permanence, there seems to be no relation in others, such as Engineering, Pedagogy, and Public Safety. In Tourism Management, the relationship is the reverse.

And how does permanence of students with regard to knowledge in other areas behave? This is shown in Figure 19 for the set of students of all courses.
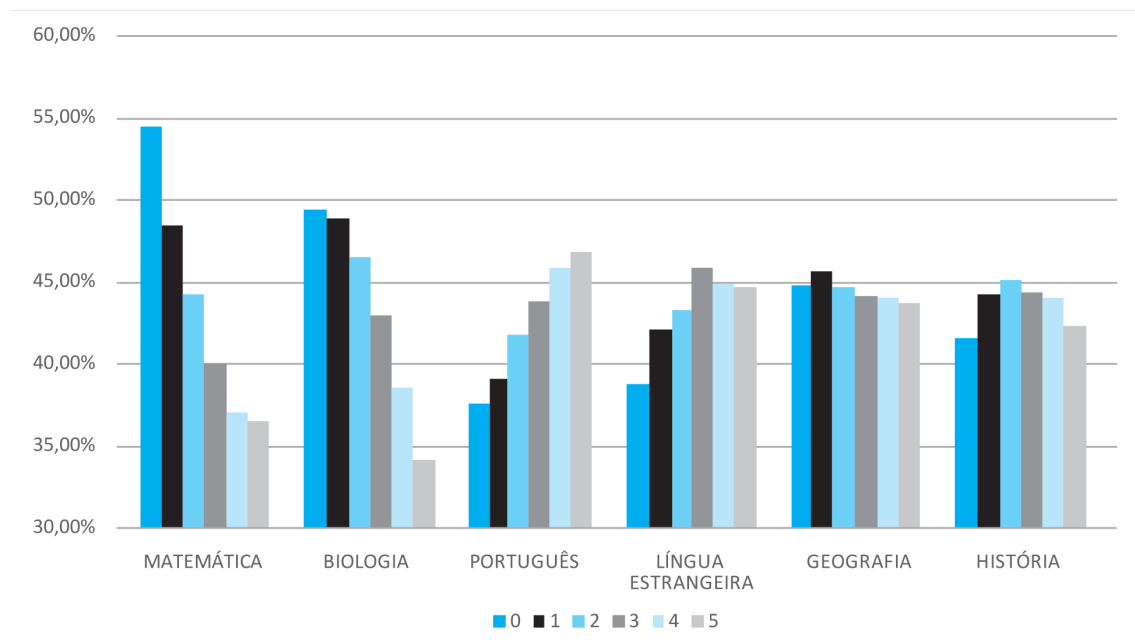

Figure 19: Permanence × number of correct answers in multiple choice questions of the admission exam

These data are surprising; they show a negative correlation of the total set of students with previous knowledge of Mathematics and Biology; little or no relation with Geography and History and positive relation with the grade in multiple choice questions of Portuguese and Foreign language.

The relationship between the students' previous knowledge and the student's adherence to Distance Education has been little studied and the results are conflicting in the literature, a fact that motivated Park's (2007) questioning about Rovai's model and that certainly deserves

greater attention. Such doubt is being reinforced by these data and by the fact that students already have a higher education diploma does not correlate positively with permanence. Other parameters seem to have greater weight.

We can verify this fact by analyzing how permanence in relation to the performance in Mathematics in the admission exam varies.
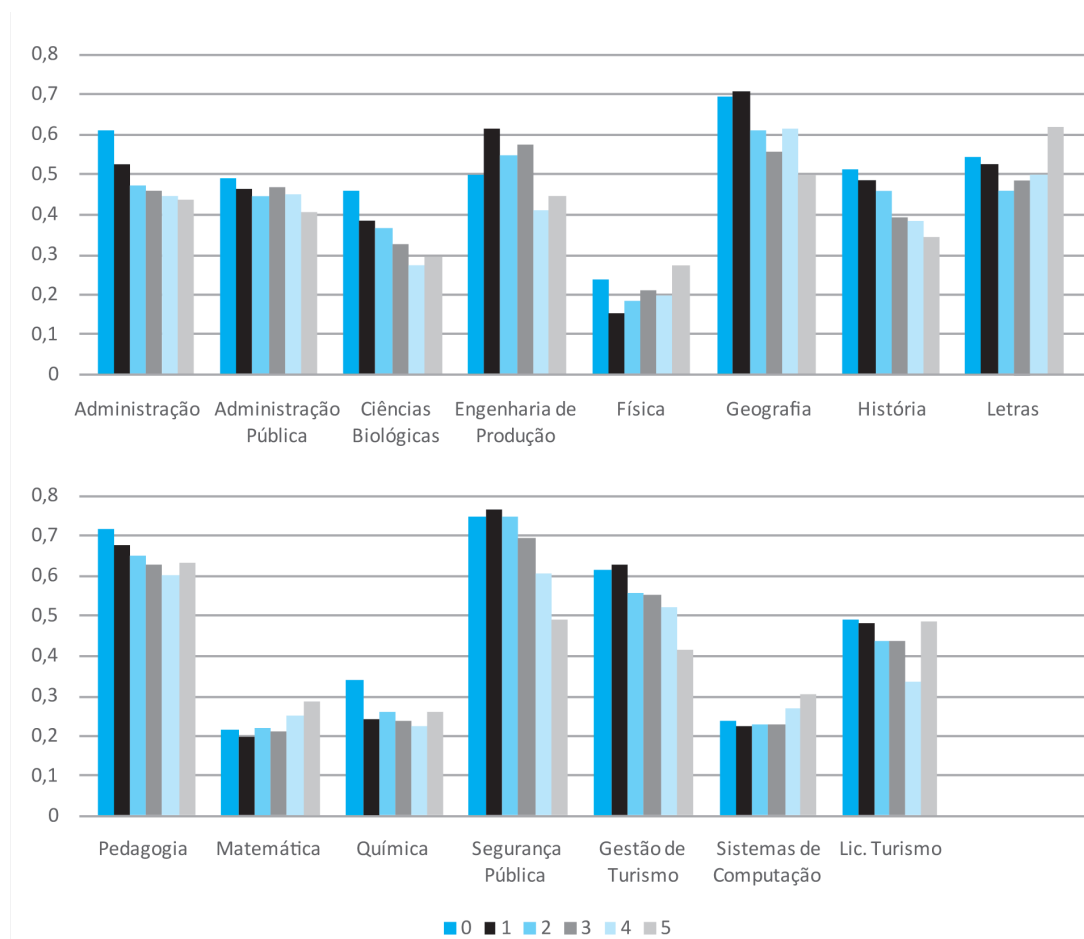
Figure 20: Permanence × admission grade in the Mathematics test, by career

Engineering, Physics, Mathematics, and Computing Systems careers show a trend towards a positive correlation - greater permanence for a greater number of correct answers - while others such as Administration, Biology, Geography, History, Public Safety, and Tourism Management indicate a trend to negative correlation. This corroborates the complexity of the subject.

4. Results discussion

As already discussed in the previous work (Biel & Masuda, 2018), students' permanence varies with the nature of the career in the same way that it varies in face-to-face teaching (Figure 1).

When assessing the correlation between permanence and personal characteristics of students, we observed that the age at the time of admission was shown to be the most universal and important, with the younger ones remaining less than the older ones; this profile is repeated in all careers, even for those who have finished high school for 14 years or more, that is, the time that has not been studied does not interfere with permanence. To us this seems to be a question of greatest relevance, since it may indicate that the methodology of Distance Education is not appropriate for younger students recently graduated from high school; may also indicate that eventually we should look for new strategies within Distance Education to captivate this audience. Regarding age at admission, an eventual maturity component (related to age) seems to prevail over a possible loss of the habit of studying, since students with less time after finishing high school have a lower permanence, following a profile similar to that age. They corroborate reports in literature that indicate older permanence of the older ones, such as Packham (2004) and Wojciechowski & Palmer (2005). According to Packham, Distance Education students with better prospects for success are typically women with no college education, between the ages of 31 and 50 who are self-employed (note that in this study all students work).

Regarding **gender**, in a global analysis, including all Cederj students, the percentage of permanence of women was higher than that of men at all ages. However, by performing the analysis separating by course we saw that this applies to Pedagogy, but not to Computing and Physics: in these courses men have a higher permanence percentage. We also find courses in which gender does not seem to be a relevant factor for permanence: History, Language Studies, and Mathematics. This type of result shows that care must be taken when considering data involving different courses.

This may be a reason for some of the divergences in the literature: some papers report the absence of gender differences (Lu & Liu, 2003; Yukselturk & Bullut, 2007; Levy, 2007), while others (Chyung, 2001; Rovai & Baker, 2005 , Price, 2006; Xu & Jaggars, 2013) report greater permanence among women.

Regarding the specific abilities of the students at the moment of admission, two factors were shown to have an important impact: the first is Portuguese language proficiency, which is positively related in most careers. This is an observation that makes sense, since the domain of the native language in reading, comprehension, and written expression is the basis for learning in the Distance learning. However, we observed that in four of our courses this correlation is small, does not exist, or may be being masked by another factor. The influence of proficiency on other areas of knowledge is even more complex: it is variable in the different courses, except in the case of Mathematics, which correlates positively in courses of natural sciences – Physics, Mathematics, Computing Systems, and Engineering.

The second factor is the positive effect of previous experience as a student in the distance mode (these have a longer permanence), especially in courses based on printed material and on the Internet, such as Cederj. This is also a somewhat a predictable aspect, since school experience for most students is that of traditional classroom teaching, where the teacher offers classes, and the student watches and studies it, often based on these classes. When arriving at Distance Education, the learning environment is totally different, using resources that may not be familiar to the student and, mainly, very dependent on the student's own initiative to use the resources made available by the course.

For this reason, a Cederj Consortium program is held for all Cederj Consortium courses, in which orientation and activities to bring students and their students closer together with the teaching and administrative staff of face-to-face service centers. This result, however, indicates a need to intensify and expand this program, ideally before the beginning of classes, both in relation to the course's dynamics, schedule and nature of tasks and evaluations, using of the virtual learning environment' tools, participation in VLE activities and face-to-face

tutorials regarding methods of study, organization, and time management of study and autonomous learning. This issue has also been pointed out in empirical researches, in which "insufficient orientation to study" has been indicated as an important reason for dropout, basically due to the sudden change from the face-to-face learning process to Distance Education in international literature (Fozdar et al., 2006; McGivney, 2004).

Thus, although Park (2007, 2009) may have reasons to challenge the inclusion of prior skills as an important element in the study of permanence – as some of our own data indicate – it is undeniable that specific skills, such as previous experience with the methodology of Distance Education, Mathematics in natural sciences' courses, to mention a few cases, certainly has an influence in permanence. In the event of an action before enrollment, a concentrated effort in the first weeks of the course is essential, extending for at least the first semester.

Regarding the so-called external factors, the lower the income the greater the permanence, in an overall analysis, a profile that remains for most courses, but in the Computing Systems course, there is an inverse situation: lower income, less permanence.

Results that associate permanence with work do not make sense if not separated by age group. When separating, in all age groups the group that does not work and receive financial help from the family is the one that has the longest stay; this effect of labor increases with the age group.

With regard to access to IT resources, it seems that the range of learning options offered by Cederj has created conditions so that, within the universe researched, not having access to these resources does not appear as an important factor for dropping out. At this point, it is worth mentioning that given the fact that in 2002 (when the first course in Distance Education was offered by Cederj) the vast majority of the students had no access to IT, the course was designed so that it could be followed with success by students without access to computer resources. The evolution of the pedagogical project since then, with the progressive incorporation of new IT resources, accompanying the increasing access to these resources by new students and the evolution of

technology, has in most cases been used to add new methodologies and technologies, without replacing those already in use.

Regarding the distance from home to face-to-face support centers, for the youngest (17 to 23 years old), the closer the the center the shorter the permanence; in the older group (34 to 53 years old), the closer the center the longer the permanence.

The results show a greater permanence for students with previous experience in Distance Education courses, in spite of all the effort made by Cederj to adapt new students to this new methodology. This is another issue that deserves further study, addressing different aspects of instructional design and previous experience of students with this methodology. Caring for this aspect early in a more intense way with the participants could reduce initial evasion directly and indirectly, through increased satisfaction and self-esteem.

5. Proposal of a new methodology for researching permanence

We observed that the methodology proposed by Rovai to investigate permanence, involving the four factors mentioned in the Introduction, may not clearly illuminate the execution of concrete measures aimed at increasing the students' adherence to the courses, since these factors are, in good part of the cases, very interrelated.

This section explores this specific aspect and proposes, albeit in a preliminary way, a research methodology specifically aimed at changes to be implemented in order to increase adherence to the courses.

5.1. Why review how to address the issue of permanence?

The profile of the student rely on motivations and broader institutional characteristics, such as: being from a public or private institution, goals, geographic region of activity, labor market in the region and the social, cultural and economic profile of the population served, among others. They are not, in general, aspects that can be modified by educational institutions.

In the case of Cederj Consortium, we did not select courses and students aiming at those who present greater chances of permanence and graduation. For this reason, we need to identify and understand what characteristics favor withdrawal and, based on this, to promote changes in internal factors (teaching, management, infrastructure), in order to create more favorable conditions for permanence and graduation for these students.

The question is: do we really know the goals to be achieved with changes promoted in internal factors? Are we adequately relating the effect on permanence performing internal changes?

The results presented in the third section unequivocally show that the relationship between permanence with different external factors and with cognitions and knowledge in admission depends critically on the course. Without this care, taking global averages of different parameters, the results may lead to the wrong conclusions. The following are two examples.

There are many jobs stating that women stay longer in courses and that age increases permanence. This is, in fact, the global behavior that we find, as shown in Figure 5, regarding the relation between permanence and gender and age. However, if we only consider courses in Mathematics, Physics, Chemistry, and Engineering, we will have a different view as shown in Figure 21, where we relate permanence by gender in these four courses as a function of age.
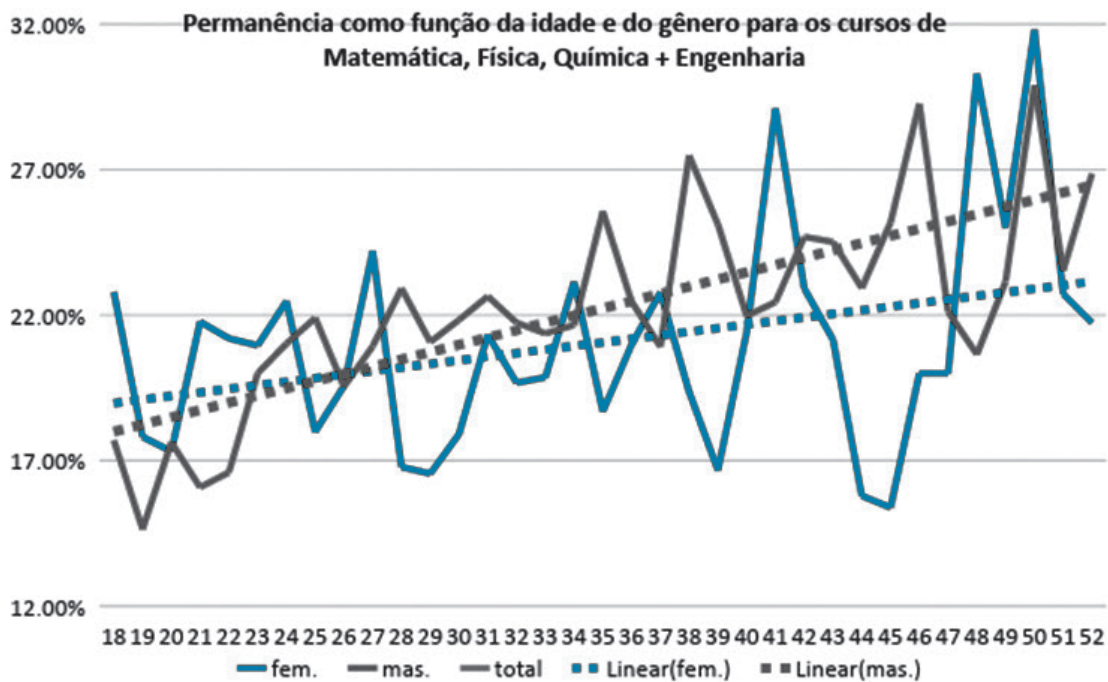
Figure 21: Permanence × admission grade in the Mathematics test, by career

This means that if we mix courses with different behaviors in relation to these two important factors (gender and age), we will not be able understand the situation properly.

Another example is the effect of mathematical cognition measured in the entrance exam in relation to permanence; for some courses, permanence increases with this cognition; for others it decreases, as shown in Figure 21.

In addition to the specific issue of the course, this work shows the strong interrelationship between different parameters that, taken together, can lead to different interpretations. An example is the analysis of permanence next to the work factor, which we discussed in section 3.2.7. Apparently, those who work, as shown in Figure 12, retain permanence, but when analyzing this question considering age, another reality arises, as shown in Table 6. In other words: if we consider the global average, without separating it by age, we can draw a totally wrong conclusion on this question.

5.2. Suggestion for changes in permanence research

We observed two important questions in the analysis of permanence results for Cederj students:

1. the permanence analysis must separate groups by course or group of courses;

2. even if separated by course, the analysis of external factors must precede that of the internal ones, since these factors are managed by the institution to adapt them, in order to "neutralize" effects of external factors that are making it difficult for students to graduate.

We suggest the following methodology to evaluate the internal issues of an institution or organization with many courses:

1. First, work separately for a course or group of courses with the same general characteristics of response to external factors and skills at admission;

2. For each course, determine the correlation parameters between the permanence and characteristics of the students, external factors and skills in admission, including the dimensions suggested by Rovai, except those internal to the course;

3. Then, for each course (or group of courses), dividing students into N different sets, considering, in each set, students who have similar answers in external factors and skills at admission;

4. Finally, to investigate the dependence of internal factors separately for each set described above, that is, by course and grouping of external factors and skills in admission. In other words, only after being separated into groups can we investigate the influence of internal factors, such as reception programs, curriculum, materials and VLE design, disciplines with higher retention rates, influence of face-to-face mentoring, and distance students, evaluation, physical characteristics, and coexistence in the regional centers;

5. Based on this analysis, seeking to elaborate and implement concrete actions aiming at a greater permanence of the students.

6. Final Considerations

This study allowed to uncover, in the universe of 53,988 students from 15 distance courses of Cederj Consortium, the relationships between permanence and variables contained in three of the four dimensions that are allowed to interfere in the permanence, according to Rovai model: personal characteristics of the student, students' skills at the time of admission and their external factors, the latter considered particularly important in the case of non-traditional students, such as Cederj.

Of the several aspects discussed here, one seems very important and is little discussed in the literature: the same variable has different effects in different courses, such as cases of gender and family income. It is therefore important, when studying the question of permanence, to take this complexity into account.

In practical terms, how to treat permanence data and how to use them to intervene to increase permanence?

This is a difficult question, since there are many factors that teachers and/or management teams could do little about. However, the negative weight of external factors and possible individual characteristics for student success may in theory be relativized with actions of HEI on internal factors.

In other words, although HEIs can not act directly on the student's own three factors, their negative effects on permanence can be changed by actions that are within their competence, provided that actions improve social integration and academic integration through guidance and follow-up of student's academic life, support for content retrieval and skills (Basic Mathematics, reading and writing skills, proficiency in the use of the virtual learning environment, study techniques), improvement of instructional design, improvement of virtual environment usability, orientation for enrollment in disciplines to adapt to workload.

Concretely, how to transform the information obtained in the improvement of our courses? Here are three possible examples in Cederj based on this analysis:

i. Observing the relationship between permanence and previous experience as a student in Distance Education, reformulating two disciplines currently offered in our courses - Introduction to Computing (compulsory for all students) and Seminar in Distance Education (offered for some courses) - making them more instrumental and effective;

ii. Observing the strong dependence of the permanence with the Portuguese language proficiency, offering a compulsory instrumental Portuguese course for students with low proficiency in the entrance exam, especially in courses in which a relation of permanence was observed;

iii. Noting that the youngest are the ones with lower permanence course, identifying disciplines in each course with the most the higher number of non-passing students in this age group and that could be the cause of dropout, to study alternatives to teaching these disciplines to increase adherence.

Finally, we emphasize that the research of permanence, mixing factors related to the four dimensions proposed by Rovai, can lead to false interpretations, requiring a greater methodological depth.

Acknowledgments

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Annex

Table 1: Permanence as a function of age at admission*

age at enr.	P	D	age at enr.	P	D	age at enr.	P	D	age at enr.	P	D
16	3	5	24	753	1321	34	742	925	46	318	317
17	63	130	25	804	1268	35	748	826	47	315	322
18	869	1666	26	826	1293	36	663	745	48	251	282
19	1225	2284	27	843	1231	37	650	747	49	226	251
20	1025	1737	28	915	1229	38	635	617	50	214	222
21	777	1428	29	850	1190	39	579	587	51	171	184
22	701	1303	30	831	1109	40	578	580	52	150	190
23	702	1209	31	817	1110	41	514	511	53	129	155
			32	826	998	42	462	449	54	105	131
			33	826	1014	43	435	414	55	88	101
						44	356	427	56	73	94
						45	346	378	> 56	263	330

* P = permanence; D = dropout.

Table 2: Number of students by permanence and dropout, by course and gender and global dropout percentage (Female + Male) per course

Course	Permanence		Dropout		Total			% Permanence		%	
	Fem	Male	Fem	Male	Total	Fem	Male	Fem	Male	Global	Gender Fem
Business	1276	1436	1371	1794	5877	2647	3230	48,21	44,46	46,15	45,04
Public administration	636	756	662	990	3044	1298	1746	49,00	43,30	45,73	42,64
Biological sciences	2161	691	3607	1720	8179	5768	2411	37,47	28,66	34,87	70,52
Production engineering	70	141	64	171	446	134	312	52,24	45,19	47,31	30,04
Physics	78	311	400	1323	2112	478	1634	16,32	19,03	18,42	22,63
Geography	290	313	169	229	1001	459	542	63,18	57,75	60,24	45,85
History	368	525	519	742	2154	887	1267	41,49	41,44	41,46	41,18
Language studies	555	185	597	202	1539	1152	387	48,18	47,80	48,08	74,85
Pedagogy	6568	678	3220	734	11200	9788	1412	67,10	48,02	64,70	87,39
Mathematics	539	856	2236	3443	7074	2775	4299	19,42	19,91	19,72	39,23
Chemistry	161	88	527	374	1150	688	462	23,40	19,05	21,65	59,83

Course											
Sec. Techn. Public and social	200	1186	66	477	1929	266	1663	**75,19**	71,32	71,85	13,79
Techn. Tourism management	394	253	280	223	1150	674	476	**58,46**	53,15	56,26	58,61
Techn. Comp. Systems	133	927	654	3402	5116	787	4329	16,90	**21,41**	20,72	15,38
Tourism – lic.	585	307	672	453	2017	1257	760	**46,54**	40,39	44,22	62,32
Overall total					53988	29058	24930				53,82

Note: The number of registrations is lower than the number of students considered in this research, since we do not have this information for students who admitted through Enem or who did not answer the socioeconomic survey at the time of enrollment.

Table 3: Number of students by permanence and dropout, course and family income

Course Name	number of students remaining				number of students evaded			
	up to 1 minimum wage;	between 1 and 3 minimum wages	between 3 and 6 minimum wages	more than 6 minimum wages	up to 1 minimum wage;	between 1 and 3 minimum wages	between 3 and 6 minimum wages	more than 6 minimum wages
Business	170	899	616	370	142	908	714	513
Public manag.	88	444	365	176	103	524	401	251
Biological sciences	426	1319	398	113	521	2005	831	339
Production eng.	9	53	61	46	11	56	62	74
Physics	27	124	96	72	101	544	412	265

Course								
Geography	64	297	117	50	35	161	92	37
History	50	284	194	107	58	359	253	150
Language studies	85	307	125	60	78	295	147	52
Bachelor's degree in pedagogy	898	3500	1212	334	374	1677	770	324
Mathematics	108	509	300	166	402	1994	1160	636
Chemistry	21	88	48	24	45	258	144	51
Technol. Public security	8	271	635	217	3	107	243	97
Technol. Tourism management	71	272	110	40	45	189	82	33
Technol. Computing system	52	359	250	153	229	1323	821	499
Tourism - bachelor's degree.	88	337	145	67	92	374	178	106

Table 4: Permanence in relation to writing grade

Writing grade	Permanence	Dropout	Writing grade	Permanence	Dropout
20	33	79	60	1782	3449
25	12	22	65	1247	1682
30	50	237	70	3119	4554
35	32	54	75	2230	2665
40	288	739	80	3132	3724
45	133	211	85	1999	2161
50	789	1938	90	2176	2475
55	397	548	95	1018	1135
			100	518	721

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