

A case of countertrend: low dropout rates among chemistry degree students explained by disposition and integration

Luciana Massi^I
Alberto Villani^{II}

Abstract

This work is part of a case study of an institution in which the students had a strong sense of belonging and membership, which was reflected the low dropout rates. The course in question was the degree in chemistry of Instituto de Química (Institute of Chemistry), henceforth referred to as the IQ, of Universidade Estadual Paulista (UNESP) in Araraquara, in the State of São Paulo. We analyzed the school and academic histories of the twenty-seven students majoring in chemistry, in relation to social and academic integration, based on Vincent Tinto's Student Integration Model (SIM). We also used the concept of disposition, originally presented by Pierre Bourdieu and revised by Bernard Lahire, in order to understand these integrations and qualitatively explain the low dropout rates, which were analyzed quantitatively. We adopted the methodology of sociological portraits, also proposed by Lahire, to analyze the interviews with the undergraduate students and their views in relation to these aspects. The portraits produced show a prevalence of educational histories that combined social and academic integration, favored by a "fit" of the previous dispositions, which were updated or enhanced in the university. By focusing on a specific institution, we saw that the conditions offered by the university, which implicitly or explicitly promote the updating of various dispositions in the graduate students, and which are favorable for their social and academic integration, are fundamental for explaining the low dropout rates. This fact makes this course unique, particularly due to the ways it creates ties with its students.

Keywords

Dropout rate – Chemistry degree – Disposition – Social integration – Academic integration.

I- Universidade Estadual Paulista, Araraquara, SP, Brasil.

Contact: lucianamassi@fclar.unesp.br

II- Universidade de São Paulo, São Paulo, SP, Brasil.

Contact: avillani@usp.br

Um caso de contratendência: baixa evasão na licenciatura em química explicada pelas disposições e integrações

Luciana Massi^I
Alberto Villani^{II}

Resumo

Este trabalho faz parte de um estudo de caso sobre uma instituição pela qual seus alunos apresentavam um forte sentimento de pertencimento e adesão, materializado em baixos índices de evasão. Trata-se da licenciatura em química do Instituto de Química (IQ) da Universidade Estadual Paulista (UNESP) de Araraquara, no interior do estado de São Paulo. Analisamos as trajetórias escolares e acadêmicas de 27 licenciandos em química, com base na Teoria da Integração do Estudante (TIE) de Vincent Tinto, quanto à integração social e acadêmica. Também utilizamos o conceito de disposição, apresentado inicialmente por Pierre Bourdieu e revisto por Bernard Lahire, para compreender essas integrações e explicar qualitativamente os baixos índices de evasão analisados quantitativamente. Adotamos a metodologia dos retratos sociológicos, também proposta por Lahire, para analisar as entrevistas dos licenciandos quanto a esses aspectos. Os retratos apontam para uma predominância de trajetórias que conjugam uma integração social e acadêmica, favorecida por um encaixe das disposições anteriores atualizadas ou reforçadas na universidade. Ao investigar o caso de uma instituição específica, percebemos que as condições oferecidas pela universidade, que implícita ou explicitamente promovem a atualização de várias disposições dos licenciandos e são favoráveis à sua integração social e acadêmica, são fundamentais para explicar os baixos índices de evasão e tornam esse curso peculiar, principalmente pelas maneiras de criar vínculos com seus alunos.

Palavras-chave

Evasão – Licenciatura em química – Disposições – Integração social – Integração acadêmica.

I- Universidade Estadual Paulista, Araraquara, SP, Brasil.
Contact: lucianamassi@fclar.unesp.br

II- Universidade de São Paulo, São Paulo, SP, Brasil.
Contact: avillani@usp.br

High dropout rates, particularly in the core sciences, are a serious problem in public universities, representing a waste of economic and human resources in a country that already faces severe problems at all levels of education. In particular, the high dropout rates among licentiate degree students in these areas tend to be higher than for the respective bachelor degree courses, further exacerbating the problem of a chronic lack of science teachers. There have been many studies dedicated to dropout rates, seeking to understand its root causes and possibly find solutions, or at least reduce it (ALLEN, 1999; BRAGA, 2002; LIMA JÚNIOR, 2013; SILVA FILHO et al., 2007; TINTO, 1993). Our research took an opposite approach: instead of analyzing cases with high dropout rates, in an attempt to understand the reasons for this situation we conducted an in-depth investigation of a specific case, in which the licentiate degree students had a strong sense of belonging and membership, reflected in the low dropout rates.

The case studied was the licentiate¹ degree in chemistry of the Institute of Chemistry (IQ) of Universidade Estadual Paulista (UNESP) in Araraquara, in the interior of the state of São Paulo. The purpose of this course is to educate chemistry teachers. However, this same institution also offers a bachelor degree in chemistry, in which the main focus is to train graduates to work in industry and research. The choice of whether to take the licentiate degree or the bachelor degree is made at the time of enrollment in the entrance examinations.

As stated above, the study was based on the observation that although the licentiate students expressed discontentment, whether because they would have preferred to go to another university, or to have taken

the bachelor degree instead, or because the licentiate degree was not conducive to teacher education, they nevertheless remained on the course. This characteristic, and above all, the ease of obtaining qualitative and quantitative empirical information on the students, the teachers, the staff, the history of the institution, and the time spent in it, convinced us of the feasibility of capturing the complexity of the phenomenon under investigation, following the methodological precepts of a case study. In fact, our study was based on data obtained from different sources: interviews with fourteen teachers of the graduate course; documents about the institution and its courses; statistical analyses on the profile of students entering the graduate course, dropout rates, and the jobs taken up by the professionals after graduating; interviews with twenty-seven licentiate students in chemistry; and the stimulated memory of one of the authors concerning the time spent at the institution.

This work presents a summary of the complete study of the relationship between the IQ and its chemistry students (MASSI, 2013), focusing on the dropout rates, integration and disposition of the students. Our objective was to analyze and understand this case, which goes against the usual trends, in which the licentiate degree in chemistry had higher retention rates than those of the bachelor degree. With this objective, we initially calculated the dropout rates of this course. We then adopted the perspective of Vincent Tinto's Student Integration Model (SIM) (1993) and the concept of habitus, originally presented by Pierre Bourdieu and revised by Bernard Lahire (2004), as the basis for analyzing the academic histories of the licentiate students, and qualitatively understanding the values that had been observed quantitatively. We used the methodology of sociological portraits, also proposed by Lahire, to analyze the interviews with twenty-seven licentiate students in relation to these aspects. Thus, based on the abovementioned theoretical and

1- The technical term "licentiate" (licenciatura in Portuguese) is used here as synonymous with "teacher education course." It confers a degree which gives graduates the legal right to teach the subject or subjects (major or minor) they have studied in university. In contrast, the bachelor's degree is geared to preparation to practice the corresponding profession.

methodological references, we investigated whether the relationship between the students' disposition and those of the institution could be associated with the SIM, to explain the low dropout rates.

Framework of analysis

Student Integration Model (SIM)

Through a literature review, we found a considerable volume of work on school dropout rates² developed primarily in the Anglo-Saxon countries since the 1970s. These studies were mainly prompted by the economic issues associated with dropout, and the concern with minority groups, who previously did not have access to this level of training. Learning, retention, and success in school have also been studied, from a perspective that lifelong learning is one of the main elements in the fight against school dropout.

We identified, in these studies, a theoretical model that is widely adopted, fairly consistent, and effective in the analysis of retention or dropout among university students: the Student Integration Model (SIM), proposed by Tinto in 1975. This theory has undergone various revisions, and has been criticized, but it continues to be widely accepted as the main theoretical model for studies on dropout rates, and has come to be regarded as almost paradigmatic. Tinto (1993) believes that the integration of certain characteristics of students with the university is key to understanding dropout. Thus, when there is a good "fit" between the students' academic skills and motivations and the social and academic characteristics of the institution, dropout rates will be very low. The author was inspired by Durkheim's analysis on suicide in his understanding of university dropout, taking the view that

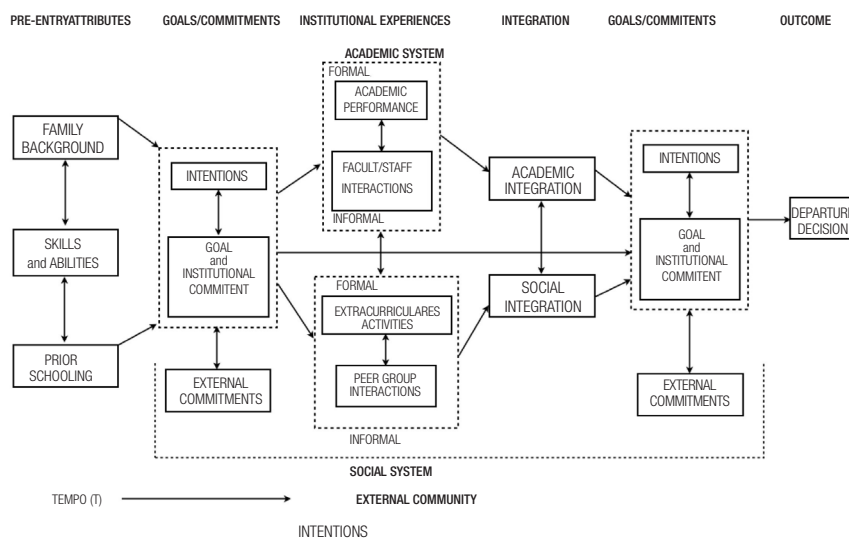
2- Although the concept of dropout and its calculation are the object of discussion in the area, this discussion is not part of the scope of this work.

entering university is similar to a person joining any other community. In some cases, this process will involve separation from previous communities through a rejection of its attitudes and values, as a prerequisite for integration. Although these initial characteristics and attributes influence performance at the university, the author emphasizes that when it comes to dropout rates, the quality of individual interactions developed with other members of the institution, and the individual perception of how far these experiences cater for the students' interests and needs, are more important than the aspects that were present prior to joining the new community. Thus, dropout is more a reflection of what happens in university than of what happened before it. Among the events that take place at the university, contact with others is the most important factor for retention. In addition, Tinto highlights the following factors: the possibility of attending university part-time; the small size of the institution, with the consequent opportunities to interact with members of the university; and the possibility of living in the university. For Tinto,

[...] an institution's capacity to retain students is directly related to its ability to reach out and make contact with the students and integrate them into the social and intellectual fabric of institutional life (TINTO, 1993, p. 204).

Considering its importance in this field of studies, and its adoption as interpretative model in our research, we present in Figure 1 a diagram that shows the components of the "fit" between the student and the institution (input attributes, intentions, goals, and commitments) and social and academic integration (formal and informal), as keys to understanding the student's decision to leave.

Figure 1: Vincent Tinto's Longitudinal Model of Vincent to explain the "Student Integration Model". Source: Tinto (1993).



Source: Tinto (1993).

The longitudinal model describes and explains student dropout or retention. To understand it, we first need to recognize that Tinto (1993) considers the university environment as a microcosm that is far less complex than society, and that can be divided into two systems: social and academic. The “academic system” refers to the formal education of students, and includes classrooms, laboratories, faculty and staff related to graduate education. The “social system” refers to the daily life and the personal needs of the students outside the academic field, and includes accommodation, snack bars, meeting places, faculty and staff. The proposed model is interactive, because it understands that student retention cannot be attributed exclusively to individual or environmental aspects, i.e. the blame for dropout does not lie exclusively with the student, or with the university, but is the result of the interaction between these two spheres. We therefore see, in the model, the interaction between a set of conditions and characteristics of the university and of the student. The entry attributes of the student relate to his or her family background (socioeconomic status, parents’ education, personal attributes, such as color, race, sex, etc.), intellectual and social skills

and abilities, and previous educational experiences. This set of characteristics is associated with the student’s intentions, goals and institutional commitments. Intentions and goals, in turn, relate to the level and type of education and career pursued by the individual, while commitments relate to the individual’s level of commitment to achieving his or her objectives, and to the institution. According to Tinto (1993), this set of attributes describes the means and financial, social and intellectual guidelines that individuals bring with them when they enter university. It is influenced by the external commitments of the individual, i.e. the events that occur outside the university life, and that can change the individual and institutional intentions, goals and commitments that existed when the student entered the institution, and throughout their academic life. Thus, they define the individual and initial conditions of interaction of the individual with the university, in which the student will have institutional, social and academic experiences that involve formal and informal social and academic interactions, as indicated in Figure 1 and detailed later in this paper. These integrations depend on a “fit” between the intentions, goals and objectives of the student and those of the

institution. At the same time, and throughout this process, events of the external community can affect student retention at the university. Following the order in which this information was presented, the theory is represented in the form of “a flow diagram indicating, from left to right, the temporal succession of events that can lead to either dropout or retention” (LIMA JUNIOR, 2013, p. 203).

Considering the national context, we found few systematic studies and institutions focusing on dropout rates. The few that we did find appear to be focused more on quantifying than understanding student dropout (SILVA FILHO, 2007; BRAGA, 2002). In our study, we explore this theoretical model from a different perspective than that of the majority of national and international quantitative studies that adopt the SIM as a basis for the construction and analysis of questionnaires applied to a large number of students from various universities.

The concept of disposition and its relationship with the Student Integration Model

In the context of the sociology of education proposed by Pierre Bourdieu, the concept of habitus is understood as “a system of rules, ways of perceiving, feeling, doing, and thinking that lead us to act in a certain way in a given circumstance” (1983, p. 65). For the French sociologist, society is divided into dominant and dominated, organized into groups or factions according to social class. Thus, identifying the material conditions of existence that characterize a particular group tends to produce systems of similar habitus, at least partially, in all the agents who share those same objective structures, resulting in a relative homogeneity of habitus. It is precisely in regard to the concept of disposition, and the assumption of homogeneity of disposition within groups, that Bernard Lahire rightly challenges Bourdieu, currently considered his main successor (BRITO, 2002).

Lahire (2001) identifies, throughout the work of Bourdieu, relatively detailed mentions of disposition in the work *La distinction* (BOURDIEU, 1979 apud LAHIRE, 2001) and the text “*L’ontologie politique* by Martin Heidegger” (BOURDIEU, 1975 apud LAHIRE, 2001)³. However, they refer only to the rarity of the conditions of acquiring disposition corresponding to the practice of a fine musical instrument; the mark of the socially constituted disposition of Malarmé, Zola and Heidegger; and the use of the terms “cultured, ascetic, and reactionary disposition, realistic hedonism and pessimistic conservatism” (LAHIRE, 2001). Thus, the author emphasizes that there is no indication of how the disposition operate, and how the analyst can reconstruct them, yet despite this, many sociologists act as though it were simple and straightforward.

For Lahire, in contrast to Bourdieu, there are no disposition for local application and modes of assessment partially linked to specific objects and domains, particularly considering the plurality of worlds or the social spheres to which we are subject nowadays. In this sense, the work *Portraits sociologiques*, Lahire (2004) presents his interpretation of the concept of disposition, and applies these ideas to the analysis of eight extensive and relative sociological portraits of various spheres of the life of a single individual.

A disposition is a reality that is rebuilt, and that, as such, is never observed directly. Therefore, to speak of disposition presupposes the accomplishment of an interpretative work to take account of behaviors, practices, opinions, etc. It is to display the principle or principles that generate the apparent diversity of practices. At the same time, these practices are constituted like so many other indicators of disposition. (LAHIRE, 2004, p. 27, italics included by us).

3- BOURDIEU, Pierre. *La distinction: critique sociale du jugement*. Paris: Minuit, 1979.

BOURDIEU, Pierre. *L’ontologie politique de Martin Heidegger*. *Actes de la Recherche en Sciences Sociales*, n. 5-6, 1975.

Thus, considering the proposition of Lahire, in our research we identified the disposition of the students and of the institution. For this, we adopted the methodology of “sociological portraits” proposed by the author to theoretically reconstruct the habitus of the individuals. We therefore ignored the predictive nature of habitus, observing, instead, the origins and repetitions of the disposition, according to the precepts of Lahire (2004). In addition, we worked with the disposition in isolated form, not assuming them to be organized under a logical and homogeneous set that characterizes a social class, as proposed by Bourdieu. This is because, for Lahire, a disposition should not be general, transcontextual, and active in every moment of the actor’s life. Furthermore, the problem of the nature and the organization of individual heritage of the disposition should be studied through an empirical work (versus system of habitus). In the same way, for Lahire (2004), the disposition is not a simple and mechanical response to a stimulus, but a way of seeing, feeling and acting that adapts to the different situations encountered.

In our research, we conducted two types of theoretical complementation on each of the aspects that make up the SIM proposed by Tinto (1993): the institution and the student. The institutional disposition are the subject of another publication (MASSI; VILLANI, 2014),

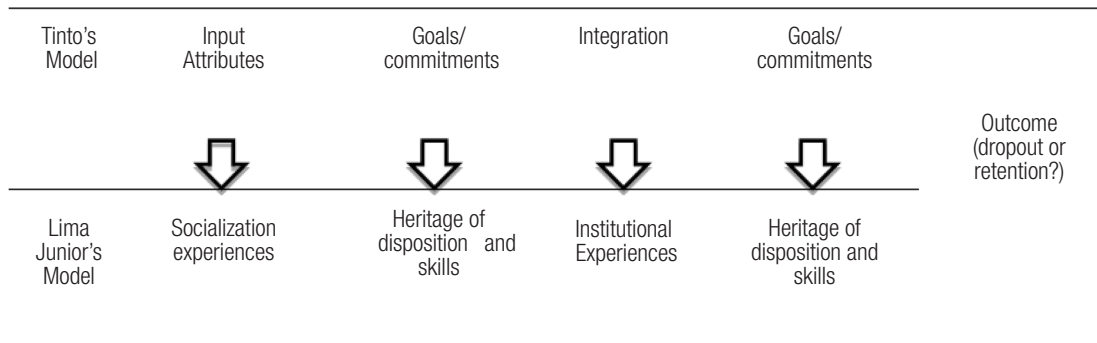
and the students are the focus of this one. In this context, we analyzed the interviews carried out with twenty-seven licentiate students. The analyses were then transformed into sociological portraits, seeking to organize the students’ academic histories and disposition according to their forms of integration with the institution, i.e. complementing the SIM.

This same theoretical association was also made by Lima Junior (2013), for whom Tinto’s model is based on the idea that “the interaction between the student and the institution updates the intentions and commitment brought by the students when entering the course” (LIMA JUNIOR, 2013, p. 214). In the same way, Lahire’s perspective on the updating or disabling of the disposition based on the context of action is based on this interaction. We therefore agree with the interpretation of Lima Junior (2013, p. 213) that

[...] It is precisely in the interaction of the skills and disposition of the students with the institutional disposition that we find the institutional reasons for dropout in higher education [...].

Lima Junior outlined a new scheme for Tinto’s (1993) dispositionalist appropriation model, based on which we produced the comparison presented in Table 1.

Table 1- Comparative diagram of Tinto’s Student Integration Model and Lima Junior’s disproportionalist appropriation model.



Source: Authors

For Lima Junior (2013, p. 202), “intentions can be considered disposition to believe, which the student incorporates at the start of his or her process of socialization (whether family or not)” and “commitment is a set of disposition to act”, so that when both are incorporated, they characterize the student’s strategies for investment in the school market. The same association can be adopted to analyze the institutional disposition. The remaining items of the diagram remain, as Lima Junior (2013) only extends the interpretation of some aspects of the SIM.

A quantitative analysis of dropout rates in chemistry

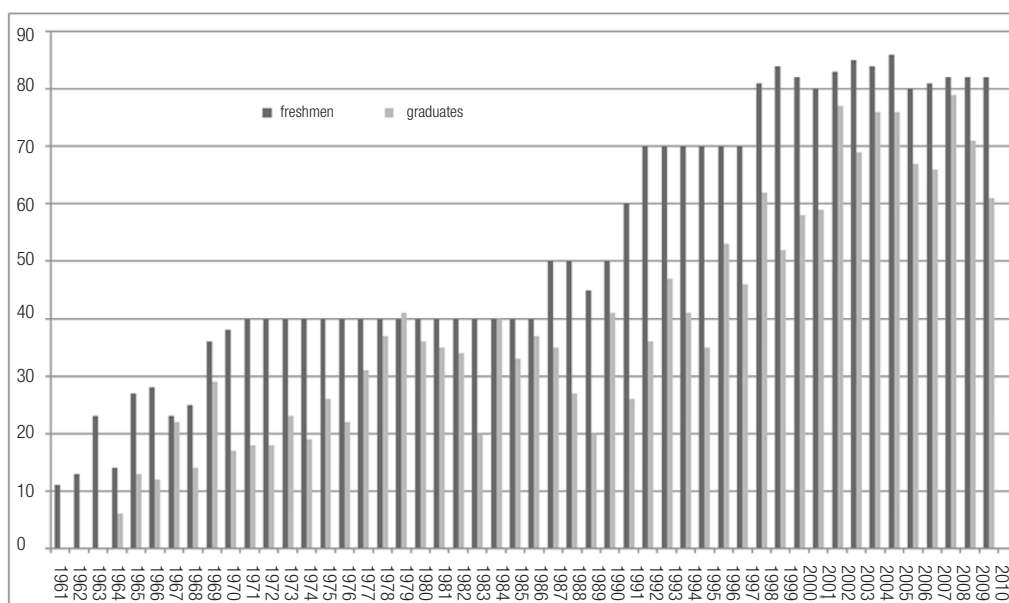
We analyzed the few data available on dropout in Brazilian chemistry courses, in order to compare these rates with those of the institution under study. Zucco (2007) adopted different references that used various forms of analysis to present the dropout rates of chemistry courses. Considering the relationship between students and freshmen at four-year intervals, we obtained an average of 46% for the period 1996 to 2005, while for the period 2001 to 2005, the average dropped to 21%. More precise data, following up the students individually until the completion of the course, and published in 1997 by the Secretary of Higher Education of the Ministry of Education (MEC-Sesu), reached national dropout rates of: 32% for the bachelor degree in chemistry; 52% for the bachelor/licentiate degree; and 75% for the licentiate degree. The high value of the licentiate degree is emphasized by the author: “The licentiate degree has been shown to have a very high dropout rate, pushing up average dropout

rate for chemistry, when treated as an area of knowledge” (ZUCCO, 2007, p. 1430).

From the Graduation Section of the IQ, we obtained annual data, from the creation of the course in 1961 through to 2010, on the number of students enrolled and the number of graduates who completed the course. Although this information does not enable a longitudinal follow-up of students, it helps us calculate the overall dropout rate. According to Silva Filho and collaborators (2007, p. 42), “the overall dropout rate measures the number of students who, after entering a given course, higher education institution (HEI) or education system, failed to obtain a diploma after a certain number of years”.

We present, in Figure 2, the number of freshman students and graduates of all the bachelor and licentiate degrees in chemistry at UNESP in Araraquara. Based on these data, we estimated the overall dropout rate, obtaining an average of 22%, with a standard deviation of 20. This value was calculated using the formula described above. However, it is not precise, because the data are global, even though the duration of each modality of the graduate course is different, and they include periods when, due to changes in the legislation relating to the licentiate degree, only the bachelor degree was available. Thus, although the formula maintains the same ratio for the calculation, it is only possible to present an approximate result for the two modalities. Regardless of these aspects, we observed higher dropout rates in the initial period of the course, with the rates declining significantly after the 2000s, to an average of 17% and a standard deviation of 9. Although the national data show large variations, we emphasize that in all the references and forms of analysis, the rates for the IQ are lower.

Figure 2: Quantity of freshmen (in black) and graduates (in gray) per year of the Institute of Chemistry in Araraquara. The figures for 2001 are estimated because they were not provided by the institution.



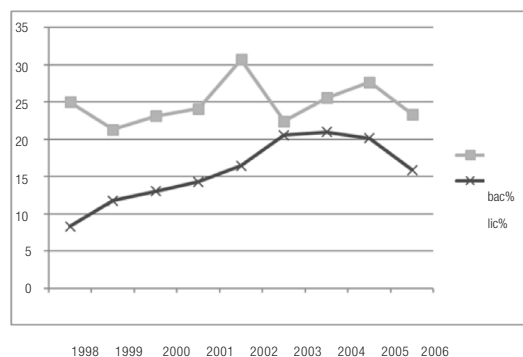
Source: Authors

In Figure 3 below, we present figures that are much closer to the reality, for the comparison between dropout rates on the licentiate and bachelor degrees of the institution studied. For the period 1986 to 2006, we obtained, from the Graduation Department, information about freshmen and graduates, which allowed us to calculate the annual dropout rate according to the equation proposed by Silva Filho and collaborators (2007). These figures promise to be more precise than those used in some international studies. The calculation enabled us to calculate the loss of students from one year to the next, based on the following formula:

$$E(n) = 1 - [M(n) - I(n)] / [M(n-1) - C(n-1)], (1)$$

Where E is the dropout, M is the number of enrolled students, C is the number of graduates, I is the number of freshmen, n is the year in study and (n-1) is the previous year. (SILVA FILHO et al, 2007, p. 645).

Figure 3: Comparison of annual dropout rates for the bachelor and licentiate degrees of the chemistry course of the IQ between 1998 and 2006.



Source: Authors

In contrast to the very high rate of 75% cited earlier, and the scenario whereby the licentiate degree caused the national average dropout on chemistry courses at the IQ of Araraquara to be pushed downwards, the licentiate presented lower rates than the bachelor degree in each of the years analyzed,

with an average of 15.7%, compared to an annual average dropout rate of 24.8% for the bachelor degree. The only study to show results similar to those of the IQ is that of Braga et al (2002), who examined the evening classes of the licentiate degree in chemistry of Universidade Federal de Minas Gerais (UFMG) for the period 1990 to 1995, obtaining an average dropout rate of around 20%, and lower rates for the licentiate degree taken as evening classes than those of the bachelor degree offered during the daytime.

Despite the good results, these values do not appear to be the result of ongoing or institutionalized policies to monitor and control dropout. In an interview with teachers of the chemistry course, we did not observe any concerns with this issue; only those who were involved in the course coordination commented on initiatives of calculation and follow-up, which were linked to some managements of the board of directors. Statements that stood out were those of Professor Clóvis Augusto Ribeiro (subcoordinator) and Professor José Eduardo de Oliveira (several times coordinator and subcoordinator of the course), who mentioned actions carried out in the 1990s and 2000s that identified a concentration of dropout soon after enrolment - making it clear that the IQ has a disadvantage in the academic field of training in chemistry in relation to its main state competitors, with Universidade de São Paulo (USP) and Universidade Estadual de Campinas (Unicamp) being the institutions of first choice when it comes to enrolment. They also highlighted freshers' week as one of the factors that contributes to the low dropout rates of the course.

The teachers also commented that the institution "does not see" the results of its actions to combat student dropout. This fact is confirmed by the analysis of articles that address dropout rates in chemistry courses (SILVA et al., 1995; BRAGA; MIRANDA-PINTO; CARDEAL, 1997; CUNHA; TUNES; SILVA, 2001; MACHADO; MELO FILHO; PINTO, 2005). These

studies suggest measures that could be adopted by institutions to minimize the problem, taking into account characteristics of the students' profile. Surprisingly, we observed that nearly all the actions proposed by the authors had already been carried out at the institution for some time, but were not linked to any specific project to combat dropout. These actions include: program to welcome students during freshers' week; program to teach calculus, through the discipline of mathematical reasoning; curricular reforms that favor the inclusion of students in extracurricular activities; the offer and management of scholarships; divulgation of the chemistry career and course in chemistry among students in secondary education, through participation in trade fairs of professions and visits by students to the IQ.

Next, we shall address the survey of school and academic histories of the licentiate students, which allows us to understand how retention is produced in the institution.

A qualitative analysis of dropout in the licentiate degree in chemistry

Survey of qualitative data: conducting interviews, and production of sociological portraits

We analyzed the academic histories of twenty-seven licentiate students of the IQ, mainly from the working and lower middle classes. We conducted extensive interviews with these students, which we used to produce sociological portraits, following the methodology of data collection and analysis proposed by Lahire (2004) to investigate disposition. We also studied their experiences in higher education from the perspective of social and academic integrations of the SIM proposed by Vincent Tinto⁴.

4- Due to space constraints, we do not detail the methodological and analytical procedures presented. This information is available in Massi (2013). Specifically, the methodology used to produce the sociological portraits will be discussed in a future publication.

The survey was based on semi-structured interviews lasting around two hours each, conducted with students in the freshmen, junior and senior years of the licentiate degree in chemistry, who agreed to participate in the study by responding to an invitation that was extended to the whole class. The themes and sub-themes identified for the interview were: family; school life, higher education, and cultural practices.

We transformed the interviews into applied social portraits, which were based on the original proposal of Lahire, but which were subordinated to a specific research problem, as proposed by Lopes (2012). The interviews were transcribed, each one resulting each in a document of around thirty pages. Based on this text, we produced sociological portraits of the students, focusing on their school and academic histories. With this objective, we used each interview to produce a linear trajectory of the student's history, based on the theoretical framework of the research, and including part of the interpretation of the data. Due to space constraints in this work, we cannot show the portraits, and we discuss only the main results of the analysis. The disposition were supplemented by considerations of Tinto (1993), adopted here as indicators to observe the types of student history (considering their forms of integration with the university).

Types of history and forms of integration between the student and the institution

In the interviews, we sought to observe the entire educational history of the students, but in accordance with the literature, we found that the school history was much less important than the academic history. It seems to us that the entrance examination (known as the "vestibular") acts as a sieve, filtering students with certain school disposition, and who have learned the minimum content required for entrance to university.

To analyze the types of history found among the students, we initially identified, in the series of interviews, the main experiences and impressions that might be associated with each form of integration. It should be noted that we analyzed the data in global form, without differentiating between the experiences of the students of different groups, as we did not find any significant differences between these portraits that would justify this form of differentiation. As the interviews were conducted at the end of the year, even the freshmen presented socializations that were very consistent with those of the graduates.

The formal academic integration was measured through the students' performance. In the case of the course in chemistry of IQ, we observed, in the majority of portraits, that: students face difficulties in calculus and physics; the number of failures among the freshmen appears to be much higher than that of the graduates; the difficulty and demands of the course appear to be minimized by a culture of cheating, which is much criticized and little recognized as a practice and; the curricular structure hinders the implementation of parallel disciplines, which would minimize delays in course.

The informal aspect of academic integration was associated with the relationship with teachers and staff. The relationship with the teachers varied considerably across the portraits: Professor D stood out in the reports, due to her concern with the students' performance, and her advice on academic life; she creates emotional bonds that are fundamental in some histories, and is directly mentioned as the person responsible for developing a love of chemistry in students, and encouraging them to stay on the course. On the other hand, students who have failed in the other disciplines often blame the teachers for their poor performance, referring to exaggerated and unnecessary demands on the teachers' part. The relationship with staff was mentioned by six students, who praised the personal relationships and

receptivity of the IQ community. This discourse is associated with a good overall evaluation of the institution, which starts with a good “first impression”; in some cases, these factors appear to have contributed to the students’ decision to study at the IQ, at the time of enrolling in the graduate course. The interviewees highlighted three aspects of the institution that contributed to this view: the fact that it is an institute and not a department; the infrastructure; and the students, former students and staff who “sell” the institute. Allen (1999) considers the first impression of the institution to be a fundamental factor in motivating students to complete their graduation.

Formal social integration occurs through the extracurricular activities of the various extension and scientific initiation (CI) projects that exist in the institution. These activities represent a benefit to the students as besides to improving their financial ability to continue their studies, it gives them a richer experience of the academic culture. Despite this, according to Zucco (2007), few chemistry students have the opportunity to experience these activities during their time at university, despite of the pay. This framework seems to be quite different in IQ, because, of the eleven students of the fourth and fifth years that we interviewed, eight had scholarships, including five CI research scholarships; and, of the sixteen freshmen, nine had scholarships, including four from the Centro de Ciências de Araraquara [Araraquara Center for Sciences] (CCA) and two BAAE (Bolsa de Auxílio aos Estudantes) student grants.

Faced with the various extracurricular activities offered, the students seem to want to “take advantage of all the opportunities”, and are in the habit of conversing with the coordinating professors of the projects, and signing up to them. In general, the students have a positive view of the variety offered by the institution. Apparently, they see the extracurricular activities as a way to apply the theory learned on the course, not seeing them as more important than the course, but more “enjoyable”.

The second form of social integration is the relationship with peers; in this sphere, we observed contradictory contributions of the community of students of the IQ. On one hand, the relationship between the students is marked by a strong competitive spirit, especially when it comes to scores, which has implications for the availability of scholarships, and a poor relationship between the different groups, marked by the existence of several small groups and little collaborative spirit between them. On the other hand, the community of students at the institution plays a fundamental role in retaining freshmen, by speaking to them in an encouraging way about what to expect from the curriculum, and the demands of the course.

Considering these possible experiences of social and academic integration, we observed four types of history in the portraits of the licentiate students; histories without integration; histories of social integration; histories of academic integration, and histories of academic and social integration.

We present, in summary form, the histories without integration or with partial integration. Only four students presented “histories without integration”, i.e. they did not experience any form of social or academic integration during their time at the university. The common factor of all these histories is a school trajectory marked by median performance, an academic history characterized by failure in several disciplines, which caused the students to drop back a class, and the fact that they did not perceive any form of social integration in relation to the course. In three students, we observed strong social integration, whether through their involvement in extracurricular activities or through their relationships with their peers, but no form of academic integration. Unlike the previous situation, the existence of social integration appears to make the students feel more motivated, even before situations of failure in various disciplines, and having to resit the first academic year. The extension, or CI, activities are highlighted in these histories as activities

that give meaning to the graduate studies and motivate learning, prompting students to think about how to apply their knowledge in practice. Three other students had a history marked by academic integration through good performance, but no form of social integration. The students in this group had in common a strong disposition for study, built in different ways throughout their lives, but each one had different reasons for the lack of social integration, such as the dedication to full-time work, living far away from the university, and an introverted nature).

In this work, we focus only on details of the students' histories of social and academic integration. Besides being the most frequent among the interviewees, this type of history gives us a better understanding of retention seen in terms of the compatibility of disposition of the students and the institution.

Histories of academic and social integration

The vast majority of the histories (17/27) presented both academic and social integration, considering variations in the different types of each of these integrations.

We consider the cases of Elias, Sofia and Beto to be cases of "moderate social and academic integration", as they were involved in extracurricular activities and had a history of failure in their graduate studies. The three subjects had fallen only one year behind. Elias and Beto were very close, and had disposition that is much more focused on the world of work. In this case, they had immediatist and utilitarian disposition which were directly related to ensuring the financial conditions for survival and adherence to the values of the job market, based on the socioeconomic situation of their families. Both had worked in different jobs since high school, so this practice constituted a past socialization that was repeated through similar experiences (LAHIRE, 2004). They had held part-time and full-time jobs throughout their graduate studies, which had led them

to fall behind academically, mainly, they explained, due to missed classes rather than to poor performance. Elias recognized the importance of the knowledge learned on the course for promoting a change of perspective on life, as he worked as a chemical technician at the laboratories of a unit of UNESP, and aimed to further his career by obtaining a master's degree. We can say that the IQ has caused the immediatist and utilitarian disposition of Elias and Beto, associated with the job, to be updated, providing them with training that has met their expectations, while at the same time, helping to change their immediatist views of their future professional careers. For Elias, the technical course initially provided him with a "job for life". However, the changes of focus during his graduate studies led him to see that a solid training at higher education level would give him better opportunities, leading him to review his professional strategies through the updating of his disposition. Also, Beto's involvement in the *Centro de Monitoramento e Pesquisa da Qualidade de Combustíveis, Biocombustíveis, Petróleo e Derivados* [Center for Monitoring and Research on the Quality of Fuels, Biofuels, Petroleum and Derivatives] (CEMPEQC) enabled him to meet his economic needs, so that he could come back and invest in his real educational interests. Guided by a utilitarian and immediatist disposition associated with work, Beto chose to take chemistry instead of physics, due to the range of job options available. Ironically, upon almost completing his graduation, he reviewed this previous decision, and ended up teaching physics, supporting by the training he had received at the IQ.

In Sophia's case, the failures of the first year led her to drop out of the class. However, she says she had devoted a lot of time to her studies and to understanding the content, but had difficulties only when it came to exams, due to the hyperactivity that she has had to deal with throughout her school life. Although all three students had low academic performance, Beto and Sofia highlighted, in their report, a strong

academic integration with the teachers and staff, which represents another form of academic integration, indicating that the collective disposition brought from their time prior to entering the university were strengthened at the IQ. Beto and Sofia have two brothers, which favors the formation of this type of disposition. Beto highlights, in his report, the important affective relationships established with friends on the course, such as with Elias, whom he calls brother, and with Professor D. Sofia, meanwhile, is more extrovert and has always had a good relationship with her colleagues and teachers. At the IQ, this disposition was strengthened, with Sofia establishing a group of friends, and closer relationships with some of the staff (with whom she shared a cake to celebrate joining the university) and with Professor D.

Also within this subgroup, we found, in the histories of Heloisa, Clara, Celina and Marcela, contrasting histories in which academic integration, represented by good performance, and formal social integration, through participation in extension and research projects, was in stark contrast to the absence of informal social integration, i.e. these three students had little interaction with their classmates, and there were even some conflicts. The main criticism expressed by these students relates to the competitive atmosphere, and the immaturity, individualism, and disloyalty of their colleagues, perceived in different degrees. Their good performance is supported by disposition they have developed since school, through following the school's models of learning, asceticism and rigorism, which they developed throughout their school histories, or which were partially transferred through a family environment of intense monitoring and enhancement of education. Competition was seen as something extremely negative, because the majority of the girls had already experienced bad relations as a result of competitive situations, associated with individualistic disposition. Clara had experienced many financial difficulties in her family history that fell upon hard times, leading her to believe

that "you can't rely on anyone but yourself". At the same time, at the beginning of her schooling, the student felt persecuted by the teachers for having an identical twin sister whose school performance was as good as hers, resulting in accusations of cheating, and consequently, an aggressive, defensive disposition in the school context, which was updated at different times in her educational history. Heloisa suffered heavy pressure from her mother to do well in school, and was always being compared with other children (although she did not help the student directly). These situations of competition and comparison generated a lot of insecurity and sensitivity in the student, leading her to hide from her colleagues her history of four years spent in preparation classes for the "vestibular" entrance examination, and her frustrated attempts to get into university. Celina had a very close relationship with her mother, marked by a strong protection, so that she found it difficult to be contradicted, associated with a fear of rejection and failure. This manifested itself in sports, where she never took part in training, despite being good at sport, preferring to avoid competitive situations. The above disposition was reinforced at the IQ by the competitive environment among the students, to the point that Celina would "fight" with everyone in her class, and with all her colleagues with whom she shared the transport to the university. Marcela, by contrast, showed a strong group-oriented disposition, maintaining intense and strong friendships. In the school environment, she often gained good positions for her performance. The close friendship between her father and the coordinator of the chemistry course at another unit of UNESP led to the student being invited to take the entrance examinations at that institution, where she also reinforced her group-oriented disposition. On asking for a transfer to the IQ, Marcela found herself in a completely different socializing context, in which she was accused of "pulling strings" to get into the institution, and was rejected by groups of colleagues who had already completed their

degrees in previous years. This led her to become withdrawn and completely inhibited her group-oriented disposition.

The intense formal social integration, through involvement in extracurricular activities, finds resonance in the utility and immediatist disposition associated with the job market, and identified in these students. Clara's economic difficulties led her to spend three years doing an activity she did not enjoy, but that provided her with a research grant, and gave her a sense of taking advantage of the opportunities offered by the institution. Heloísa took up a trainee placement in a laboratory, in order to fulfil her abandoned dream of training in pharmacy and making a career in the area. Celina and Marcela took up training placements at the laboratories of the CEMPEQC, which helped confirm their decision to take this course, and gave them a certainty about their future professional careers.

In this context, there is clear potential of the concept of disposition for understanding "why individuals with different past socializing experiences react differently to the same external stimuli" (LAHIRE, 2004, p. 27). As we have already discussed, the academic environment experienced at the IQ represents an experience that is relatively homogeneous and consistent with their disposition; however, the agents' reaction to this socialization context is completely different. According to Lahire (2004, p. 27), the disposition represent the sedimented past of the agents, and is converted "into more or less lasting ways of seeing, feeling and acting, i.e. into *dispositional* characteristics: propensities, inclinations, habits, tendencies, persistent ways of being...".

The students belonging to the second subgroup shared a strong social and academic integration, marked by high levels of involvement and identification. However, the analysis of their academic histories leads us to the conclusion that this strong integration was formed at the university, through the various forms of enticement exerted by the institution.

The first type of enticement observed could be called winning the students over, which operates in students who appear to lack motivation on the course, or for chemistry at the time of entering the university. Through it, the institution appears to convince students who have little interest in chemistry, or in higher education, to become involved in research and extension activity, which in turn, encourages them to remain on the course. We observed this process of winning over in the portraits of Carla, Fernanda, Joana and Tamara.

Carla, Fernanda and Tamara had school disposition (ascetic and rigoristic) that were not formed until later on, in the preparation course for the entrance examination, because throughout their schooling, they had failed to learn how to study, due to the weak requirements imposed by the school. On the other hand, Tamara had strong planning, ascetic and rigoristic disposition as a result of her family socialization, marked by an intense study discipline instilled by her mother. These dispositions supported the students' good academic performance, measured by their formal academic integration. On the other hand, the informal academic integration, and formal and informal social integration of these students was based on their participation in extracurricular activities, with different resonances of disposition in this group. Carla and Fernanda supported their interest in the course through the range of opportunities offered at the IQ, leading Carla, originally interested in the course of Physics, and Fernanda, originally interested in the course in aeronautical engineering, to alter their original desires to the reality of the institution, without experiencing frustration. The projects enabled them to realize how diverse careers in chemistry are, and the opportunities offered by the IQ. Besides their interest in chemistry, another aspect of the activities is highlighted in the experiences of Joana and Tamara; both had group-oriented disposition, which fits perfectly with the type of experience provided by the projects, mainly associated with the university extension. Tamara also found support in the strong competitive climate that prompted her

to look for extracurricular activities, and to see the graduate studies as a challenging and motivating context for study.

Among the students who had enrolled with interest in the chemistry course, we observed two other types of enticement, different from winning the students over. One of the main characteristics of the institution is a strong investment in research, with a goal of high quality standards. We observed enticement through research in the interviews with Bóris, Eduardo, Gustavo and Verônica. Gustavo presented an excellent school history and a keen interest in research, specifically in the area of biochemistry, prior to entering the course, and his academic career was strongly marked by involvement in CI. Bóris and Gustavo had both had very difficult histories prior to entering the course, due to a lack of finances - Bóris had worked as a bricklayer -, but they were always dedicated to studying, developing a school-pedagogical mode at school that led them to pass the entrance examination, followed by almost immediate contact with research, which today represents a real opportunity for social advancement. Verônica also had a background of weak capital in terms of school culture, and faced various obstacles to passing the entrance examination for the chemistry course, which was not her first option. The student closely followed in the footsteps of her older sister, who also did not want to take chemistry and is now on her way to obtaining a master's degree. She works at the same laboratory as her sister, and sees in CI the possibility of going abroad and taking a postgraduate degree. Despite their different life histories, these students brought disposition associated with research: school-pedagogical mode; rigorism; asceticism; reflection; originality; leadership; rationality. These dispositions were fully reinforced when the students became involved in research projects, which also represented a concrete opportunity to change their lives through the academic career desired by the entire group. In some cases, due to a lack of finances, a lack of life experiences, and the jobs that these students had to do before coming to university, the prospect of research, besides personal interest, represented

an "easy life", with unique benefits such as social recognition and the possibility of travel.

A third type of enticement occurred through the extension activities, and was observed in students Diogo and Laura, who had strong group-oriented habitus prior to entering university, but who were already sure of their decision to take chemistry at UNESP. Diogo and Laura were closely involved with the Catholic Church, where they played instruments and were active in charitable works. Diogo had studied at a school of religion, and had even thought of becoming a priest, always with a strong concern for others and a desire to give back to society. Laura was involved in these activities at the same time, and devoted herself to various cultural projects in the areas of dance, music and theater. Diogo had a more deeply-ingrained school habitus, and had been approved for the bachelor degree, but had transferred to the licentiate in the second year, as he thought the curriculum was too restricted, and did not like the poor atmosphere among the students, and also because he perceived that there were no "outlets" like those to which he was accustomed. At the university, both students had devoted themselves to various tasks before they met. Laura had been involved in extracurricular activities, and was currently engaged in student research. Diogo had reorganized the public speaking group of the university; he has a band that plays at student events, and he acts in the Alchemy drama group. Despite having updated his previous dispositions, we noticed in the report that the institutional environment was decisive for extending and strengthening these dispositions.

Final considerations

In this article, we explore the ideas of social and academic integration of the SIM of Tinto (1993), in order to understand the sense of belonging or membership of the students, suggesting that the combination between social and academic integration, as well as the consonance of disposition, produce results that transcend success and retention at university.

This combination of factors made up for the low motivation of students who had not originally opted for chemistry, or for UNESP.

The sociological portrait proved to be an essential methodology for investigating the individual disposition. In our study, they were related to the institutional disposition and could serve as a tool for the SIM of Tinto (1993) which, as for the institution, identifies intentions, objectives, and institutional commitments, as well as external commitments, as criteria for determining the “fit” of students. These portraits show a predominance of histories that combine social and academic integration, favored by a “fit” of the previous dispositions, which are updated at the university. In addition to the use of portraits, we also found elements that could be exploited in studies on school and academic histories, and that do not usually deserve much attention, such as the heterogeneity of family heritage, and the role of the institution in creating, activating, and stimulating certain disposition.

Complementing the analysis presented in this article, our research (MASSI, 2013) enables the interpretation on low dropout rates to be broadened, as we see that nearly all the items highlighted in literature review as key potentializers of student retention and success were already present in these students' experiences at the institution: the students worked part-time at the university through grants for extension and research activities; the institution is small, favoring interaction between

students, teachers and staff, while at the same time, it is recognized and promotes a good impression among new students who are joining the institution; the majority of the students come from the region, and prefer to live in Araraquara while taking the course, living very close to the university and sharing student accommodation with their classmates.

In addition, in the broader work (MASSI, 2013), we noticed that licentiate degree students, who came from less privileged socioeconomic backgrounds than those of the bachelor degree, had opportunities to supplement their training throughout their studies, completing the course with the same objective chances of taking postgraduate degrees, and finding jobs, as those who took the bachelor degree. This framework enabled them to reverse what would likely have been their destiny, based on their social condition, and this change of life being a factor that contributes to a sense of belonging and membership (MASSI; VILLANI, 2012).

By investigating the case of a specific institution, we found that the conditions offered by the university, and the combination of social and academic integration, are fundamental for explaining the low dropout rates that make the IQ unique, especially in the ways it creates ties with its students. Despite this positive picture, we should not forget that some students are only partially integrated, or present no kind of integration at all, but this minority does not seem to be the object of concern or institutional actions.

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Luciana Massi has a PhD in chemistry from the Programa de Pós-Graduação Interunidades em Ensino de Ciências (Inter-unit Postgraduate Program in the Teaching of Sciences) of Universidade de São Paulo, and a master's degree in sciences from the Instituto de Química de São Carlos (São Carlos Institute of Chemistry) of Universidade de São Paulo (USP). She is an assistant professor in the Department of Didactics of the Faculdade de Ciências e Letras de Araraquara (Araraquara Faculty of Sciences and Languages) of Universidade Estadual Paulista (UNESP).

Alberto Villani has degree in philosophy - Licenza - Aloisianum Facultas Philosophica (1966), a degree in physics - Laurea - University degli Studi di Padova (1969), and a PhD in physics from Universidade Estadual Paulista Júlio de Mesquita Filho (1972). He is a livre-docente (full professor) at Universidade de São Paulo (1987) and has a post-doctorate degree from Università di Bologna (1989). He is currently senior professor at Universidade de São Paulo.

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Página 976.

Onde se lia **habitus**

Leia-se **disposition or dispositions**

In the article “A case of countertrend: low dropout rates among chemistry degree students explained by habitus and integration” DOI: **10.1590/s1517-9702201512135667** published in **Educação e Pesquisa**: Revista da Faculdade de Educação da USP, v. 41, n. 4, p. 975-992, 2015, please change:

Page 975, 978, 982, 984, 985, 987-989, 991.

Page 977, Column 2, Line 27.

Page 980, Column 1, Line 23, 42 e 43. Column 2 (all).

Page 981, Column 1, Lines 3, 9, 11, 15, 19, 22 and 30. Column 2 (all) and Table 1.

Page 990, Column 2, Lines 33 and 35

Where it is writtten **habitus**

Please read **disposition or dispositions**