General Satisfaction in Chemical and Biological Engineering Courses: What Matters?

A students' perception study

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***Abstract*—This study was developed in a partnership of five Higher Education Institutions (HEI): three Portuguese and two Brazilian (hereinafter identified as A, B, C, D and E, respectively). The study included a questionnaire distributed and answered on a voluntary basis by students of Chemical and Biological Engineering courses. The questionnaire aimed to identify and analyse the determinant factors of students' satisfaction in their courses covering aspects like educational and social university life. According to the main goal of the present study - to assess the satisfaction level of the students concerning six vectors: teacher role, student-teacher interaction, learning assessment, course organization, working conditions, and academic environment - only some of the collected data were analysed. Correlations were tested to identify the items considered the most important to students' general satisfaction with the course. The analysis performed for some items pointed out that there are significant differences between HEI, indicating that the study should be made considering each HEI separately. Nevertheless, in average, the degree of satisfaction' agreement was higher than 3.2 in all HEI (Lickert scale: 1-strongly disagree to 5-strongly agree). Also, the analysis of those differences shows that they do not have the same pattern. In the general satisfaction items one of the HEI stands out with the highest average score, however, in the specific items this institution showed similar behaviour to the others. Students' general satisfaction with the course and the level of agreement in each of the six referred vectors show a statistically significant positive relationship. Also, a positive teachers' attitude, in general, reflects a positive interaction with students, highlighting the effect of teachers' attitude on the students' performance.**

Keywords—students' perceptions; satisfaction questionnaires; Chemical Engineering courses; Biological Engineering courses; higher education.

I. INTRODUCTION

The modern life paradigm requires relevant changing in teaching and learning in Higher Education. The innovation in methodologies to effectively develop skills in engineering students, useful to improve competencies in the professional environment, is highly dependent on teachers' performance and willingness to change.

Learning encompasses different steps, including the reception of information over several methods/strategies and posterior processing [1, 2]. Teacher´s attitude, style and methodology used must be compatible with the learning style of students to be effective when transmitting information and to instil the interest in learning and processing it.

According to the Guide for Higher Education Institutions, 2012, of IMHE (Institutional Management in Higher Education) [3] the teaching quality matters for students' learning outcomes. In fact, nowadays this is a great challenge as HEI need to meet the students' expectations and at the same time teachers' requirements in which concerns the present and the future. The vision and strategy of HEI must be aligned to perspectives of learning and teaching in a world in permanent evolution where adaptability, while maintaining quality standards, is a crucial condition. Educational innovation is required to achieve better student's learning as reported by Serdyukov [4] in which concerns USA reality. However, this is

a worldwide requirement. Furthermore, it is an important issue to identify factors, besides quality teaching, that contribute to student's learning. In this context, students´ satisfaction is a good indicator to establish the most important aspects in the success of their formative process in engineering [5, 6]. HEI facilities, organization and services are directly related to students' satisfaction as pointed out by some recent studies [7, 8].

This article is divided in five sections besides introduction. Section II presents the characterization of eight courses in the area of Chemical and Biological Engineering available in five Portuguese and Brazilian HEI. Section III states the objectives and research questions. Section IV contains the materials and methods. In section V the results are presented and discussed, and in section VI general conclusions are drawn.

II. Courses Characterization

In this section a brief description of the eight courses considered in the study is presented by HEI. The first three HEI are Portuguese and the other two are Brazilian.

A. HEI A

In HEI A the Biological Engineering master degree is an integrated course with 5 years, in daytime regime. The study plan integrates 10 semesters with a total of 300 ECTS. With the exception of the last semester, students have 5 or 6 different subjects in each semester. The first two years include the fundamental subjects of basic sciences, engineering sciences and also some basic subjects related to the Biological Engineering branch. During all the course students have a total of 40 ECTS of laboratory subjects representing 480 contact hours. Some other subjects also have a practical component, with a total of 90 contact hours. The total of laboratory classes represent around 24% of the contact hours until the end of the fourth year. In the 2nd semester of the 4th year there is a subject dedicated to project in process engineering (10 ECTS). In the 9th semester students must do an individual project in Biological Engineering and the other subjects are optional. The last semester is dedicated to the master dissertation in Biological Engineering (30 ECTS). During the course, some complementary subjects are available.

B. HEI B

Presently, three courses exist in the Department of Chemical and Biological Engineering of HEI B with affinity to Chemical Engineering: two graduations (1st cycles), Biological Engineering and Bioengineering, and one master degree (2nd cycle), Chemical and Biological Processes. The graduation in Bioengineering was created recently and at the moment only students in the 1st academic year exist. All the courses run in daytime regime.

Biological Engineering graduation (1st cycle)

The Biological Engineering degree provides a strong component of experimental education (35% of the classroom academic load), with the development of methods and techniques particularly relevant to the exercise of a professional activity. The degree is organized in 6 academic semesters, each one with 30 ECTS. Five different subjects exist in each semester, including one subject totally devoted to laboratory classes. In the 3rd academic year one subject in each semester is optional and the student can choose from a set of subjects belonging to industrial management or basic engineering sciences scientific areas.

Bioengineering graduation (1st cycle)

The graduation in Bioengineering aims to provide an integrated and comprehensive training in the field of life sciences, combining the engineering techniques and the biology field, allowing a specialization in areas such as Biological Engineering and Environmental Technology, the two course branches. The study plan integrates 6 semesters, with 30 ECTS each. The first 3 semesters are common to the 2 branches, 2 semesters are specific to each branch and the last semester culminates with an internship in order to provide the students with a first contact with the real industrial world. Bioengineering degree also offers a strong component of experimental education with the development of particularly relevant methods and techniques for the exercise of professional activity (around 38% of the total contact hours of the 5 scholar semesters).

Chemical and Biological Processes master (2nd cycle)

The master in Chemical and Biological Processes is structured in 4 semesters, with a total of 120 ECTS. The first 2 semesters correspond to the scholar component and each semester comprises 5 subjects: 3 of them compulsory, one being a practical subject in laboratory environmental, and 2 elective subjects, one involving laboratory practice and the other selected among subjects in areas of complementary knowledge. The 3rd and 4th semesters are mainly devoted to the work of Dissertation/Internship/Project. Students can choose to undertake an internship in industrial context or a dissertation in Research & Development (R&D) activities related to the master's scope. The 3rd semester also includes a compulsory subject, Seminars, with regular meetings with students where topics in areas of transversal knowledge for the practice of engineering activity are discussed.

C. HEI C

The education in Chemical Engineering in HEI C is available in two cycles, graduation (1st cycle) and master (2nd cycle) degree. The courses run in daytime and after work classes, and students may opt between the 2 schedules.

Chemical Engineering graduation (1st cycle)

The 1st cycle of Chemical Engineering graduation in HEI C has 3 academic years (6 semesters with 30 ECTS each, making a total of 180 ECTS). This course includes basic education in sciences (maths, chemistry, physics and biology) and engineering sciences as well as more specific chemical engineering subjects, combining theoretical basis with practical and processes application perspectives. The course is structured in such a way that there are 5 or 6 different subjects in each semester, and one of these subjects is an integrated laboratory. In the last semester students develop a final project (10 ECTS) preferably in a business environment (industrial or laboratory) or in school as an engineering project. The internship option allows students to have their first professional experience in a real work environment. The curriculum includes 675 hours of

laboratory/practical classes in nine subjects, representing about 34% of the total contact hours of the graduation. With this course HEI C graduates professionals able to manage projects, in terms of products or processes, in laboratory or industrial companies. Students acquire multidisciplinary knowledge allowing them to support technological innovation and sustainability in industrial production, quality control, environmental management and new products and materials development.

Chemical Engineering master degree (2nd cycle)

The 2nd cycle of Chemical Engineering in HEI C (master degree) has 2 academic years (4 semesters, 120 ECTS). Three curricular plans for the 2nd cycle are proposed, related with three different specialization areas. In each of the 3 first semesters there are 5 to 6 different subjects. The last semester is occupied exclusively by the dissertation, but students are required to start this final work already in the first semester, together with other subjects. Apart from the final dissertation there are 17 different subjects in this master programme. Ten of those are common subjects from chemical engineering domain and the remaining are specific to each one of the specialisation areas. All subjects are compulsory. The curriculum is based on the development of advanced knowledge in areas such as processes' optimization and integration, chemical reactors, applied thermodynamics, biological processes and transport phenomena. During the 4 semesters students interact with research and development centres, and they analyse real study cases in order to enhance their multidimensional skills of analysis, planning and new technologies implementation for problem solving. The laboratory subjects in the master programme occupy 135 hours of classes, representing 14% of the total contact hours (excluding final dissertation). In the 3rd semester students must develop a project in chemical engineering (including design of equipment and economical analysis). Their final work of Dissertation/Internship (34 ECTS) may be performed as an internship in a laboratory or industrial company (not less than 420 hours in the company) or as a research and development project, in school.

D. HEI D

The Chemical Engineering graduation in HEI D is presented in two programmes: with daytime classes (10 semesters) or with after work classes (12 semesters). In the first case, each semester includes from 7 to 9 different subjects. The programme with 12 semesters runs with 6 to 8 different subjects in each phase. In this Brazilian HEI the graduation has a total of 4608 contact hours, corresponding to 256 academic credits (in this HEI one credit is equivalent to 18 hours of classroom work; this is a different measure of students' work, not directly comparable to ECTS). The programme has a strong emphasis on basic sciences in the first 2 years. The new technologies are based on physical, mathematical, chemical and biological sciences, what means that the scientific base is a very important instrument for the professional of Chemical Engineering to develop his functions in the industry. The future chemical engineers formed by this HEI have a generalist education in the last 3 years, with a strong focus on the fundamentals of the chemical engineering sciences and technologies and without emphasis in any specific area. This allows the professionals to work in any process industry or to develop their own business. In this sense, the Chemical Engineering grade also provides knowledge in entrepreneurship and social aspects. Furthermore, in the first year students have two hours per week of sports and along the course 360 hours of other academic-scientific-cultural activities. The last semester is occupied by an internship in Chemical Engineering, in an industrial company (414 hours). The practical component of the graduation in terms of laboratory classes (468 hours) represents around 11% of the total scholar hours (excluding internship).

E. HEI E

The Chemical Engineering course at HEI E has a comprehensive curriculum that focuses on all the principles of the profession. This is a 5 years (10 semesters/phases) degree, with 9 semesters of daytime classes. In each semester the programme includes from 5 to 7 different subjects. The entire Course has a total of 4464 hours of classes, including 216 hours of optional courses related to professional skills. In the first phases, subjects of basic contents such as Physics, Chemistry, Calculus, Mathematics and Introduction to Chemical Engineering are taught, which provide the necessary basis for the professional of the area. The student then studies specific subjects of the course. Examples are: Thermodynamics, Transfer Phenomena, Reactor Design, Biochemical Engineering, Process Analysis and Simulation, Environmental Engineering and Chemical Industries. At the end of the course, the student has the ability to design a chemical industry, to be accomplished in the Course Completion Project discipline. In the 10th phase, the student needs to do an internship in a company (720 h), to have contact with the day-to-day of the profession. In addition, various extracurricular activities are made available, aiming at developing the desired profile in the job market in the future. Laboratory classes (486 h) represent about 13% of the total scholar hours (9 semesters) in this programme.

III. Objectives and Research Questions

The main objective of the present study is to assess the satisfaction level of the students concerning six main vectors: teacher role, student-teacher interaction, learning assessment, course organization, working conditions, and academic environment. This assessment is performed in a global trend perspective.

To accomplish the objective, a set of hypotheses was established:

Hypothesis 1 (H1): In average the students' level of agreement regarding the six referred vectors are similar in the considered HEI.

Hypothesis 2 (H2): In general there is a positive correlation between the students' general satisfaction with the course and the level of agreement in each of the six referred vectors.

IV. Material and Methods

This section presents the questionnaire developed, its validation and the methodology followed in its implementation. The sample characterization is also presented.

A. Questionnaire

The questionnaire aimed to identify and analyse the determinant factors of students' satisfaction in chemical and biological engineering courses.

The questionnaire comprises 3 main parts:

1. Student's characterization: age, gender, higher education institution, course, degree, curricular year, semester, regime, number of registrations in the course, and student status (regular/working-student);
2. Fifty-nine items, divided in eight groups: 58 classified in a 5-point agreement Likert scale: 1 (Strongly Disagree) and 5 (Strongly Agree), with the neutral point being neither disagree nor agree, and 1 item with multiple choice;
3. One open question allowing student's suggestions and opinions (optional).

The second part allowed to determine the student's perception regarding the following groups: Student Interest (SI); Teacher Involvement Perception (TIP); Student-Teacher Interaction (STI); Assessment of Student Learning (ASL); Course Organization and Functioning (COF); Infrastructures (IS); Academic Involvement and Management (AIM) and General Satisfaction (GS).

Since the applied questionnaire is based on a previous one, developed and applied by the authors [9-12], only the main changes will be detailed here. The first modification was related to the adaptation of technical terminology to the field of engineering (from Electronics/Electrical Engineering to Chemical and Biological Engineering). Also, a new group for students' satisfaction and perception evaluation was considered in the present questionnaire: Assessment of Student Learning (ASL). This new group has 6 items: the assessment rules were followed; the assessment methodologies are effective and appropriate to the different subjects taught; the participation of students in learning activities was prized; the time allocated to the assessment tests is adequate to the volume of subjects taught; the student has an active voice in the assessment methodology suggested by the teacher; the student is encouraged to be actively involved in the process of monitoring his/her performance. All these items were evaluated using the same 5-point agreement Likert scale.

B. Validation

The questionnaire was semantically and statistically validated.

Before the questionnaire application it was semantically analysed within a group of students identifying any ambiguous issue and small bugs. In this step no changes were needed.

Then it was delivered to all students enrolled in all academic years in the courses. With a random sample of the collected data it was possible to perform the statistical validation, based on the Cronbach's alpha by using the SPSS®, version 22 [13]. A set of 250 questionnaires was gathered indicating its appropriateness. The sample size was considered sufficient for the study of internal consistency for a 5-points scale [14]. Also, the reliability analysis was conducted considering the subscales individually, i.e., based on the eight groups defined in the second part of the questionnaire (as described above): SI, TIP, STI, ASL, COF, IS, AIM and GS.

To all of the eight groups (subscales) of the students' satisfaction in their course questionnaire, all the corresponding Cronbach's alpha were higher than 0.75 (0.77 for SI, 0.88 for TIP, 0.83 for STI, 0.81 for ASL, 0.89 for COF, 0.84 for IS, 0.85 for AIM, and 0.87 for GS), indicating a good reliability [13]. None of the items affects the reliability if deleted and all data have the item-total correlations value above 0.30, meaning that the item is well correlated with the scale.

C. Methodology

The questionnaires' delivering was made to all students enrolled in all academic years in the courses considered for this study, by two different ways: in person and with a printed form (HEI B and C) or through an on-line version (HEI A, HEI D and C). In both cases, the questionnaires were answered on a voluntary basis and students took no more than 15 minutes to complete it. In order to involve the largest number of students the questionnaires were delivered in two moments: April and June 2017.

When the questionnaires were delivered in person and with printed form the following procedure was taken: representative classes of each year were chosen; permissions to distribute the questionnaires were granted; one of the authors made an initial explanation of the study purposes in each class. For the other three HEI students answered an on-line questionnaire and the purpose of the study was detailed in the invitation email sent to the students by the course director.

For the statistical analysis a non-parametric approach was used since the data are not normally distributed (based on Shapiro-Wilk test, the agreement scores for all the items show a statistic test with a significance level less than 0.05). The Kruskal-Wallis H test was used to establish if there are statistically significant differences between the HEI under analysis on the assessment students' scores for the identified set of items. Also, the Spearman's rank-order correlation, r_S, was used to measure the strength and direction of association between each item and the students' general satisfaction.

D. Sample Characterization

A total of 637 questionnaires was received from a population of 1440 enrolled students, according to Table I.

TABLE I. SUMMARY OF THE SAMPLES DISTRIBUTION

	HEI					Total
	A	**B**	**C**	**D**	**E**	
Enrolled students (N)	270	81	345	443	301	1440
Questionnaires (n)	80	58	226	239	34	637
Representativeness (%)	29.6	**71.6**	**65.5**	**54.0**	11.3	44.2

The representativeness of the sample in HEI A (29.6%) and HEI E (11.3%) was not considered acceptable. So only the other three HEI (B, C and D) were considered with a total of 523 questionnaires. From these, 517 were completely answered and

considered valid for analysis. This value corresponds to 59.5% of the students' population in the three HEI (869 enrolled students). From the 869 enrolled students, 10.8% of the fully answered questionnaires (n=517) belong to HEI B, 43.0% to HEI C and 46.2% to HEI D. Based on the purpose of the present study this sample size was considered acceptable and adequate for statistical inference [15].

With a confidence level of 95% and ±3% precision, considering a correction for finite population (N=869 students), it would be necessary a sample size of 480 students. This value is lower than the received valid 517 questionnaires. The dimensions of the three sub-groups (HEI B, C and D) are considered acceptable for the same level of confidence.

Although the results of HEI A and E are not considered in this paper, this is an ongoing work and the authors intend to repeat the query in the next academic year, in order to get representative samples for all the five HEI. This will hopefully allow a more complete study.

Table II summarizes the descriptive statistics regarding the main characterization variables of the students that completely answered the questionnaires (n=517).

TABLE II. SUMMARY OF THE DESCRIPTIVE STATISTICS OF THE STUDENTS' CHARACTERISTICS

	HEI B	HEI C	HEI D	Total
Questionnaires (%)	10.8	43.0	46.2	100
Gender				
Male (%)	28.1	32.7	34.3	32.9
Female (%)	71.9	67.3	65.7	67.1
Age				
≤18 (%)	5.3	16.4	15.9	15.0
19 <> 21 (%)	15.8	47.1	47.2	43.8
22 <> 24 (%)	59.7	23.5	30.5	30.6
≥ 25	19.2	13.0	6.4	10.6
Mean Age (x ± SD)	22.9 ± 2.4	21.4± 4.1	21.7 ± 3.3	21.7 ± 3.5
Regime of Class				
Daytime (%)	100	67.9	53.1	64.5
After work (%)	0	32.1	46.9	35.5
Students with working status (%)	8.8	17.5	60.7	36.5

The mean age is 21.7 years (SD = 3.5, range 17-47 years) and 58.8% are aged 21 years or less. In all HEI the majority of students (67.1%) are female (HEI B 71.9%, HEI C 67.3%, HEI D 65.7%). Regarding classes' regime HEI C and HEI D are the two institutions that have both daytime and after work classes. However, all HEI have students with working status (HEI B 8.8%, HEI C 17.5%, HEI D 60.7%).

V. RESULTS

In order to meet the objective of the present study, the selected items for analysis were:

- *In general, teachers perform positively* (TIP_8);
- *In general, teachers have a positive interaction with students* (STI_5);
- *The assessment methodologies are effective and appropriate to the different subjects taught* (ASL_2);
- *The course is well organized* (COF_11);
- *I am satisfied with the environment and working conditions of the School* (GS_1);
- *I am satisfied with the academic environment (cultural, sports and leisure activities)* (GS_2).

The mean values, standard deviation (SD), median, minimum and maximum values for all these items in the three HEI are presented in Table III. The same type of data is presented in Table III for two other items that reflect the overall satisfaction with the course:

- *In general, I am satisfied with the course* (GS_3);
- *I would recommend the course from this institution to a friend* (GS_4).

In all items, the mean values are >3 reflecting a positive agreement feedback from students (notice that all the statements are formulated in a positive direction). In the General Satisfaction items (GS3 and GS4) mean values are even more positive (> 3.6), and HEI C presents the highest scores.

TABLE III. DESCRIPTIVE MAIN STATISTICS FOR EACH ITEM

Item	HEI	Mean	SD	Median	Min	Max
TIP_8	B	3.86	0.75	4	2	5
	C	4.02	0.62	4	2	5
	D	3.99	0.84	4	1	5
STI_5	B	3.80	0.77	4	2	5
	C	4.02	0.63	4	2	5
	D	4.07	0.78	4	1	5
ASL_2	B	3.16	0.97	4	1	5
	C	3.57	0.78	3	1	5
	D	3.64	1.03	4	1	5
COF_11	B	3.66	0.89	4	1	5
	C	3.82	0.82	4	1	5
	D	3.64	1.04	4	1	5
GS_1	B	3.69	0.84	4	1	5
	C	4.11	0.63	4	2	5
	D	3.96	0.79	4	1	5
GS_2	B	3.38	1.14	4	1	5
	C	4.02	0.76	4	1	5
	D	3.78	0.93	4	1	5
GS_3	B	3.74	0.98	4	1	5
	C	4.19	0.64	4	2	5
	D	3.96	0.95	4	1	5
GS_4	B	3.66	1.22	4	1	5
	C	4.38	0.67	4	2	5
	D	4.10	1.05	4	1	5

Even though it was the authors' expectation that no difference between courses/institutions would be found, in four of the six specific items (TIP_8, STI_5, ASL_2, COF_11; GS_1 and GS_2) statistical differences were registered.

For TIP_8 and COF_11, hypothesis H1 is verified. There are no significant differences (Table IV) meaning that, in general, teachers perform positively (TIP_8, H(2)=2.27,

p>0.05) and the courses are well organized (COF_11, H(2)=2.86, p>0.05) independently of the institution.

For the remaining items, a tendency is observed: HEI B shows systematically lower scores, although positive.

TABLE IV KRUSKAL-WALLIS TEST STATISTICS FOR THE THREE HEI

	TIP_8	STI_5	ASL_2	COF_11	GS_1	GS_2
H	2.27	6.83	12.39	2.68	14.35	16.81
df	2	2	2	2	2	2
p-value	0.322	0.033*	0.002*	0.262	0.001*	0.000*

*: statistically significant at the 0.05 level

Concerning GS_1 and GS_2, the social and academic environment and working conditions of the schools may be applied to justify the differences. So, this point may be an important issue to take into account for improvement by those in a position of responsibility.

In relation to teachers' interaction and evaluation methodologies (STI_5 and ASL_2, respectively) a more complex analysis is required and falls out of the main scope of this study.

Some correlations were tested with SPSS to identify which of the six selected items are the most important to students' general satisfaction with the course, reflected by the answers to questions GS_3 (*In general, I am satisfied with the course*) and GS_4 (*I would recommend the course from this institution to a friend*). The results obtained are presented in Table V.

TABLE V VALUES OF THE SPEARMAN CORRELATIONS, R_S

	TIP_8	STI_5	ASL_2	COF_ 11	GS_1	GS_2	GS_3
STI_5	0.69*	1.00					
ASL_2	0.47*	0.38*	1.00				
COF_11	0.46*	0.47*	0.40*	1.00			
GS_1	0.49*	0.46*	0.39*	0.46*	1.00		
GS_2	0.44*	0.46*	0.35*	0.43*	0.60*	1.00	
GS_3	0.52*	0.50*	0.46*	0.53*	0.59*	0.55*	1.00
GS_4	0.47*	0.49*	0.43*	0.48*	0.52*	0.46*	0.72*

* Correlation is significant at the 0.01 level (1-tailed)

All the obtained results show a statistically significant correlation (for all the obtained values of the Spearman correlations, r_S, p<0.01). So, there is a significant positive relationship between the students' general satisfaction with the course (GS_3 and GS_4) and the level of agreement in each of the six referred items (TIP_8, STI_5, ASL_2, COF_11, GS_1 and GS_2). In this sense, hypothesis H2 is verified.

Furthermore, and observing the values in Table V, a positive teachers' attitude (TIP_8), in general, reflects a positive interaction with students (STI_5) (r_s=0.69). This result is in accordance with the study developed by Ulug et al. [16] that highlights the effect that teachers' attitude has on the students' performance. Regardless of the tendency observed on the students' scores in HEI B (Table III) and the significant differences in four items (Table IV), the positive relationship, previously identified, is also observed even when analysed separately by HEI (Fig. 1).

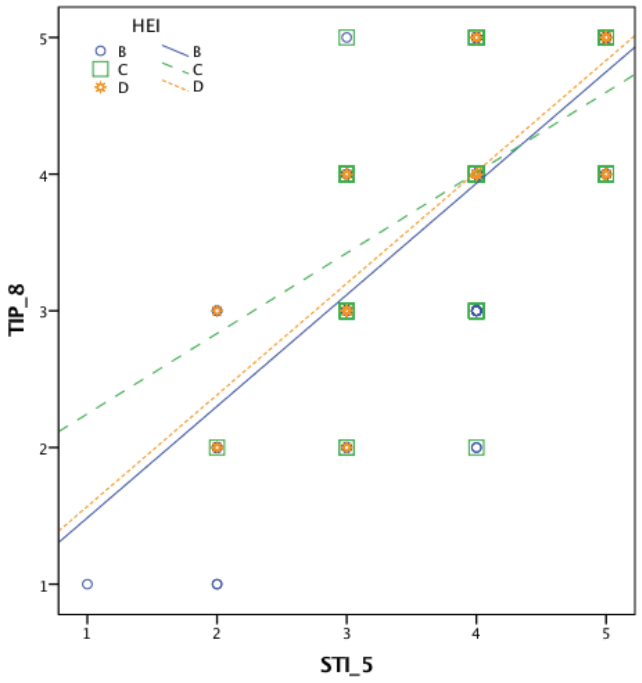

Fig. 1. Correlation between "Teachers have a positive interaction with students" (STI_5) and "Teachers perform positively" (TIP_8) for HEI B, C and D.

VI. CONCLUSIONS

The work presented in this paper is part of a collaboration project between five Higher Education Institutions (HEI): three Portuguese and two Brazilian. The overall goal of this project is to identify and analyse the determinant factors of students' satisfaction in their Chemical and Biological Engineering courses.

In this study students' level of satisfaction was assessed through six vectors: teachers' performance, student-teacher interaction, learning assessment, course organization, working conditions, and academic environment.

A total of 637 questionnaires was filled in by students on a voluntary basis from a population of 1440 pupils. The representativeness of the sample in two of the five HEI was not considered acceptable and the analysis was performed with three HEI, two Portuguese and one Brazilian (corresponding to 517 valid questionnaires, 59.5% of student population).

The analysis performed using the six vectors shows that there are significant differences between HEI in four of them. The items where there are no differences indicate that, in general, teachers perform positively and the courses are well organized independently of the institutions.

Through a separate analysis considering one HEI at a time it is shown that the tendency of those differences does not have the same pattern. In the General Satisfaction items one of the

HEI stands out with the highest average score, however, in the specific items this institution showed similar behaviour to the others.

The correlations tested to identify the items considered the most important to students' general satisfaction with the course lead to the conclusion that all of the considered vectors have a positive influence in students' overall satisfaction. Also, a positive teachers' attitude, in general, reflects a positive interaction with students, highlighting the effect of teachers' attitude on the students' performance.

Further analysis will be conducted to determine other items that may influence students' satisfaction. Also, an analysis along the academic years will be considered in order to understand if there is a behaviour pattern over time.

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