Undergraduate Engineering Course Evaluated by Students Truth or Mith? A Brazilian Experience

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Abstract: The Faculty of Engineering of the State University of Rio de Janeiro, Brazil, produced a Didactic Evaluation System (SAD) to access the quality of its courses. The system comprises a graphical and interactive computer program having as input data, information collected in student opinion polls. The research is focused on lecturer's didactic quality, lecturer expertise on the taught subject, human relations between the lecturer and the class, etc. Each question is answered in terms of a degree ranging from poor to excellent. All these information are continuously stored, generating a database which enables the production of several analysis reports. These reports include: graphical information about the evolution of a single lecturer performance, comparisons of individual lecturer's achievements with Faculty or Department average grades. Several questions arise when these data are processed and analyzed. The most frequent query is related to the reliability of the student's opinion. The more common doubts are associated to the idea that students can fear a negative reaction from the lecturers upon an unsatisfied evaluation. Others consider that student's performance should also be part of the evaluation process. This paper provides some of these answers, based on the developed evaluation methodology described previously.

Keywords: evaluation system, engineering course, engineering education

1. Introduction

The State University of Rio de Janeiro, UERJ, is a Public University funded by the State of Rio De Janeiro. Its students, after sitting an entry exam, can attend their chosen courses free from any fees and taxes. Its faculties and institutes are respected by their excellence, all over Brazil.

The Faculty of Engineering, part of the Technology Center, of the State University of Rio de Janeiro offers a choice of five different engineering habilitations: civil, electrical, mechanical, process system and cartography. Nowadays 2800 students are registered in the Faculty of Engineering. The medium duration of the Engineering Course is ten semesters divided in two complementary phases: the Fundamental and the Professional Cycle. The first four semesters are dedicated to fundamental Cycle that offers a range of basic disciplines common to all engineering courses. These disciplines cover the fields of mathematics, physics, chemistry and basic computer sciences. The other semesters are dedicated to the professional cycle in which the different engineering habilitations emphasis and skills are offered.

Since 1996, the Faculty of Engineering of the State University of Rio de Janeiro (UERJ) is engaged in an institutional project called The *Modernisation of Engineering Courses and Curriculum's at UERJ*. This project, supported and sponsored by FINEP, has its main goal related to the revaluation of the engineering curriculum and courses, in order to adequate the future engineers to the new engineering professional concepts of the XXI century. This new strategies will prepare them to face and adapt themselves to the constant evolution of technology.

To fulfill this objective the Faculty of Engineering established a series of goals to create corrective actions to be incorporated in short, medium and long terms [1], [2] e [3]. These investigations confirmed that these goals could only be achieved if a strict methodology of internal quality evaluation of the courses/disciplines present in the engineering curricula was to be used. This was the main motivation for the creation and implementation of a permanent system of evaluation of the engineering courses.

Several questions arise when the data obtained by the system's use is processed and analyzed. The most frequent query is related to the reliability of the student's opinion. Other common doubts are associated to the idea that students can fear a negative reaction from the lecturers upon an unsatisfied evaluation. On the other hand, its common sense that student's performance should also be part of the evaluation process. This paper provides some of these answers, based on the developed evaluation methodology described previously.

2. Didactic Evaluation System (SAD)

The philosophy of the Didactic Evaluation System (SAD) is based in three fundamental issues:

1) Necessity of obtaining from the client/student information regarding the quality of the product/lecturers offered;
2) Necessity of obtaining information regarding the all the courses present in the Engineering curriculum (including courses taught by lecturers form other academic institutes: Math, Chemistry, Physics, etc.);
3) Necessity of establishing a continuous evaluation mechanism procedure.

The system is based on a graphical and interactive computer program that deals with a student/lecturers database and also with information present in a series of forms collected in student opinion polls. All these data is stored generating the SAD system database. With this information in hand, analysis reports are produced in a simple format classified by course or lecturer. A series of associations can also be obtained through comparisons of the performance of a single course/lecturer to the mean grade of the referred Department/Faculty. A grade ranging from 1 to 4 is associated to the analyzed option. From this analysis a graphical visualization of a concise general performance of the lecturer's according to the students opinions can be obtained. The obtained results, sent in a standard report form to all the departments, are currently being use as efficient tool to motivate lectures to constantly improve their courses. Further details on this subject is presented elsewhere [3].

The form conception (Fig. 1) had the aim to develop a concise evaluation tool that considered not only the subject/course relevance but also the lecturer's performance. Being based in student's opinion the data capture mechanism was developed to warranty a large participation of the engineering students. To achieve this objective, the opinion polls took place at registration period and, to preserve the opinion's confidentiality, no identification is present in the returned forms.

3. Student Evaluation True Or Mith?

The process started with an evident reluctance, apprehension and mistrust from the students. Many students abstained from participating, leading to non-reliable results. However, since 1998/2 an increase of the student participation could be observed (52,72% to 67,94%), producing very interesting results.

The goal of desired student's participation with the evaluation process is 80%. The authors believe that superior values of student's participation could lead to distorted results, affected by answers containing non-responsible opinions. Consequently, making the process compulsory, option generally used in a great number of didactic evaluations, can lead to the same distortions.

The didactic evaluation system was conceived in order to generate a series of reports that could enable the comparison of an individual lecturer performance with the mean of the student grades that attended his course, fig. 2. The main objective of this methodology was to determine the reliability of the student's didactic evaluation.

This analysis can be processed considering individually different groups of students possessing similar course average grades (CAG). This procedure becomes possible because the student cannot be identified. On the other hand, the student's course average grade is present in the form's inferior corner in a codified manner.

The present work depicts a series of analysis classified in groups of students according to their course average grade (CAG): good (7 to 10); medium (5 to 7) and poor (0 to 5). The definition of these three classes was performed according to its real value in relation to analyzed group of students. The minimum approval grade in the engineering courses is 5 in grades that can range from 0 to 10. With this information in mind the third group is associated with students that failed the analyzed course. On the other hand, students possessing a course average grades greater than 7 are in general the top students of their class, which are generally approved without the need to sit the final exams.

The third group of students is situated between these two extremes roughly representing the course average student performance.

STATE UNIVERSITY OF RIO DE JANEIRO – UERJ
TECNOLOGICAL SCIENCES CENTRE – CTC
FACULTY OF ENGINEERING - FEN

Registration Number: XXXXXXXXXX **Name: John** **CAG: 9,0**

In order to access the student' s opinion regarding its courses the Faculty of Engineering asks you to consciously fill the form below. The form' s top section can be separated from the present section to preserve the confidentiality of your opinion.

(CUT HERE)

A	**Course Global Concept**	**1 - Poor**
B	**Lecture' s Didactic Skills**	**2 - Regular**
C	**Lecture' s Subject Knowledge**	**3 - Good**
D	**Adequacy of lectures and course evaluations**	**4 - Excellent**
E	**Lecture/Students Human Relationship**	**X - Without opinion**
F	**The totality of the course program was covered?**	**Y - Yes / N - No**
G	**During this course did you feel the lack of knowledge from previous courses? Which ones?**	

CODE	T.	COURSE	**A**	**B**	**C**	**D**	**E**	**F**	**G**
FAF3368	01	ENGINEERING MANAGEMENT						YES( )	
FEN5385	02	DIGITAL TECHNIQUES II						YES( )	
FEN5453	01	TELECOMMUNICATION PRINCIPLES III						YES( )	
FEN5463	01	SERVOMECHANISMS AND CONTROL III						YES( )	
FEN6274	01	ALGORITHMS ANALYSIS						YES( )	
FEN6283	01	COMPUTER FUNDAMENTALS						YES( )	

Drop your form in the box

Fig. 1. SAD Evaluation Form

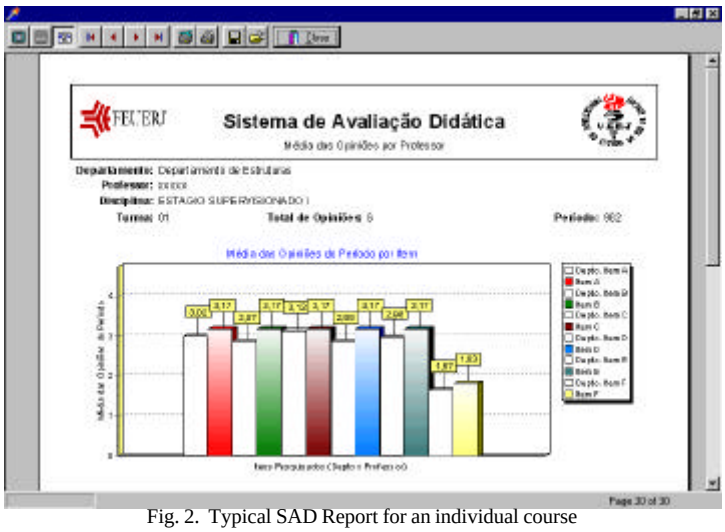

Fig. 2. Typical SAD Report for an individual course

The following results reflect the student opinion collected during the period comprehended between the first semester of 1998 and the second semester of 1999.

3.1 Lecturer's Evaluation versus Student's Evaluation

The success or failure of any didactic evaluation process substantially depends on the responsible and constructive nature of critics present in the student's evaluation. Good or poor evaluation's grades, established in an inconsequent manner tend to distort and discredit the whole evaluation process. On the other hand, poor evaluations usually are discredited, or lead to less severe course evaluations jeopardizing the learning process. It is also common knowledge that students generally evaluate positively less severe lecturers, independently of their real teaching skills.

The ratio between the lecturer/students evaluation for all the engineering courses evaluated over the investigated periods possessed mean and standard deviation values of 1.12 and 0.22. These results indicate that despite the difficulty level of the course or student's course average grade a reasonable equilibrium of both evaluations becomes evident. If individual evaluations of the analyzed period are performed grade always superior to one appears indicating that the student's evaluation tended to be in favor of a lecturer's good performance.

3.2 Students Evaluation in Terms of Their Academic Performance

When an institutional academic evaluation is performed based solely on student's opinions several questions appear. One of the most significant queries is related to the association of the results reliability to the student's academic performance. Several lecturers believe that students possessing a poor academic performance would tend to evaluate in a negatively way in order minimize their failure.

The global number of engineering courses considered in the present analysis was equal to 250. A closer inspection of this group indicated that only 23% (58 courses) presented at least 5 students in each of the CAG defined categories, figure 3. This fact confirmed the hypothesis that the didactic evaluation was not significantly influenced by the student's performance. On the other hand, when the 58 disciplines that presented a three CAG class configuration, defined previously, are considered some interesting conclusions can be drawn: 29% of this courses presented no significant variation on the didactic evaluation when the CAG classes are individually considered; 45% of the course evaluation was directly influenced by the first class (CAG greater than 7); finally 26% of the course evaluation was influenced by the second and third classes (CAG less than 7), figure 4.

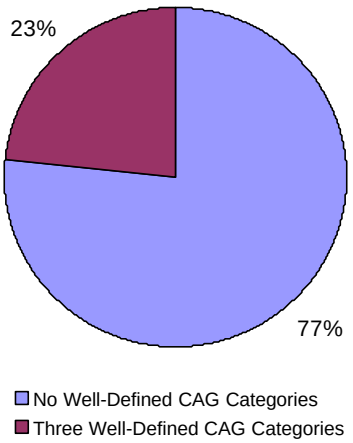

Fig. 3. General SAD Analysis

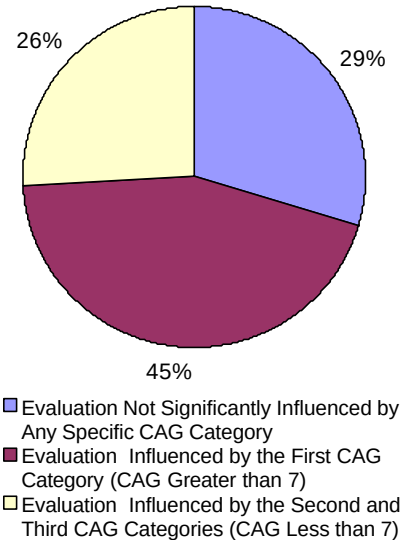

Fig. 4. Detailed SAD Analysis

4. Final Remarks

This paper described the results obtained with the use of a Didactic Evaluation System (SAD) developed by the Faculty of Engineering of the State University of Rio de Janeiro, Brazil. The evaluation mainly focused on lecturer's didactic quality, lecturer expertise on the taught subject, human relations between the lecturer and the class, etc. The Didactic System produced a series of reports including: graphical information about the evolution of a single lecturer performance, comparisons of individual lecturer's achievements with Faculty or Department average grades.

A simple analysis of the produced reports enable the assessment of true validity of a didactic evaluation based solely on student's opinion. One of the most frequent queries was related to the ideal numbers of students that would truly represent an honest and impartial evaluation. The author's believe that the student's participation should be around 80%. Superior values of student's participation in other words, making the process compulsory, can lead to distorted results.

Another question is associated to the idea that students can fear a negative reaction from the lecturers upon an unsatisfied evaluation. To overcome this fact the proposed methodology included no student identification to preserve the opinion's confidentiality. This strategy increased significantly the student's participation over the years.

Some researchers believe that student's performance should also be part of the evaluation process. The present methodology made possible evaluation analysis to be performed taking into account the student's academic performance. Three groups of students were then considered according to their course average grades (CAG): good (7 to 10); medium (5 to 7) and poor (0 to 5). When this procedure was implemented over the analyzed database only 23% of the engineering courses presented at least 5 students in each of the defined categories. This fact contradicted the idea that the didactic evaluation was significantly influenced by the student's performance.

Further studies considering courses that could be represented by the three defined classes pointed out that 71% presented some didactic evaluation variation. The results also indicated that no difference was made if half a point or a single point in a maximum four points was considered to be the limit to define that two classes had a different opinion over a single course.

This investigation proved to be an useful tool to identify courses that are constantly out of the standard usually accepted in academic area. A refined investigation of these courses could them be performance to confirm the results provided the use of the didactic evaluation system. The present investigation is now focusing in discovering efficient ways to correct misjudgments or to improve the system's performance.

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