What do students think of my way of teaching? An approach in a developing country

¿Qué piensan mis alumnos de mi forma de enseñar? Un enfoque en un país en desarrollo

Jesús Gabalán-Coello[1]
Fredy Eduardo Vásquez-Rizo[2]
Michel Laurier[3]

Abstract

The present study is an academic construct that seeks to know which aspects that influence the overall performance appraisal of a teacher, in terms of the variables universally accepted by the scientific community are: compliance, commitment, ownership, methodology, evaluation and relationships interpersonal. This study takes as a source of information the opinions of students, gathered through questionnaires perception of the development of courses in a Colombian university. A grouping is done by the subject areas they belong to the subjects taught, recognizing the specificity of the nuclei of these subjects. A procedural level binary logistic regression was used, identifying the dichotomy of each variable teacher who is in the standard of quality defined by institutional policy. This intends to conclude on the incidence of particular satisfaction in teacher performance variables regarding overall satisfaction, seen at both disciplinary and institutional levels.

Keywords

Evaluation, higher education, teacher education/development, assessment, education, developing country.

Resumen

El presente estudio es un constructo académico que busca saber qué aspectos influyen en la evaluación general del desempeño de un maestro, en términos de las variables universalmente aceptadas por la comunidad científica: cumplimiento, compromiso, propiedad, metodología, evaluación y relaciones interpersonales. Este estudio toma como fuente de información las opiniones de los estudiantes, reunidas a través de cuestionarios de percepción del desarrollo de cursos en una universidad colombiana. La agrupación se realiza según las áreas temáticas a las que pertenecen las asignaturas impartidas, reconociendo la especificidad de los núcleos de estas asignaturas. Se utilizó una regresión logística binaria a nivel de procedimiento, identificando la dicotomía de cada variable que se encuentra en el estándar de calidad definido por la política institucional. Con esto se pretende concluir sobre la incidencia de la satisfacción particular en las variables de desempeño docente con respecto a la satisfacción general, visto tanto a nivel disciplinario como institucional.

1 PhD in measurement and evaluation in education, University of Montreal, Montreal, Canada. Master in Engineering, Universidad del Valle, Cali, Colombia. Vice-President Academic, Universidad Católica de Pereira, Pereira, Colombia. Americas Avenue # 49-95, Pereira, Colombia. (57) (6) 3124000. Correo electrónico: jesus.gabalan@ucp.edu.co ORCID iD: http://orcid.org/0000-0001-7674-8849

2 PhD in Information and Communication Management, Universidad de Murcia, Murcia, España. Master in Information Sciences and Knowledge Management, Instituto Tecnológico de Estudios Superiores de Monterrey, Monterrey, México. Full Professor, Universidad Autónoma de Occidente, Cali, Colombia. 25 Street # 115-85, Cali, Colombia. (57) (2) 3188000. Correo electrónico: fvasquez@uao.edu.co ORCID iD: http://orcid.org/0000-0003-1398-6174

3 PhD in Curriculum, University of Toronto, Toronto, Canada. Master in Applied Linguistics, University of Ottawa, Ottawa, Canada. Full Professor, University of Ottawa, Ottawa, Canada. 75 Laurier Ave E, Ottawa, ON K1N 6N5, Ottawa, Canada. 613-562-5222. Correo electrónico: mlaurier@uottawa.ca ORCID iD: https://orcid.org/0000-0001-8162-9967

Jesús Gabalán-Coello, Fredy Eduardo Vásquez-Rizo, Michel Laurier

Introduction

In the education field, one can identify a diversity of evaluation methodologies, which are intimately related to the contextual characteristics in which the process is carried out with the actors involved, with its function, with its purpose, with its methodological approach, etc.

In this sense, one of the main types of existing assessments, which is known by the name of: educational evaluation; defined by Marques (2000) as one conceived as an instrument of social control (to know the level of achievement of planned educational objectives) and as an input for improving and optimizing the educational system in which it is applied. That is to say, it is a type of evaluation that is more oriented towards providing information that can improve the quality of education, than by the sanction, classification, or selection.

That definition, limited in the context of Stufflebeam & Shinkfield (2007), for whom the assessment, in this case educational, should be a positive force that serves the progress and can be used to identify strengths and weaknesses in the training process, aimed at improvement.

From this perspective, many countries have implemented systems of professor assessment, seeking to improve the work of education; however, these systems show different characteristics and emphasis (Flores, 2012). By reviewing the state of the art in the field, we can say that, generally speaking, there are two obvious purposes in professor assessment: the first associated with a purely formative posture, encouraging the professional development of professors, and the second related to a measure of professor performance, with all the implications that this implies (Avalos & Assael, 2006; Stronge, 2006).

Within this framework, researchers are increasingly convinced that the professor assessment should answer both purposes (Colby et al., 2002; Stronge, 1995), arguing that professor assessment systems can and should play an important role in improving professor competence; a situation that necessarily affects the quality of education provided and the performance and progress of the student (Ovando & Ramírez, 2007; Sanders et al., 1997).

Accordingly, various information sources acquires a key role in these professor evaluation systems, bringing relevant data around the professor´s assigned functions. And it is precisely from the consideration of these sources that you can explore, describe, or explain the activities of the teacher, since there are unique aspects on which only the employer, only peers, or only students can judge.

Therefore, initially, a review of the elements considered in the state of the art of teacher assessment is performed and finally arriving to the building of a model in order to operationalize the object of work, since it requires determining the weights of the variables in the notion of teaching quality.

Literature Review

The Assessment of Teaching

In keeping with this, the teacher assessment, since its inception, has focused on the analysis of dimensions that try to collect the academic work of the professor. In this sense, an important aspect is based on the dynamics of teaching developed by the teacher, among other functions performed. Authors such as Marsh (1987), Feldman (1989), and Centra (1993) have made concrete proposals on aspects and components to investigate. Table 1 shows the common elements, studied by those authors.

Table 1. *Common components of the evaluation of teaching*

Components	Marsh	Feldman	Centra
Planning and organization	-Planning the course as a whole -Organization of each course section -Planning the workload of the students -Planning taking into account the subjects that are difficult for the students	-Organization of the course as a whole -Preparation of course periods -Clarity on objectives -Availability of the professor -Planning the workload of the students -The professor takes into account the difficulty of the course -Value of the teaching materials	-Planning the course as a whole -Organization and development of each course session -Planning the workload of the students -The professor takes into account the difficulty of the course
Implementation in the classroom	-Adopt an appropriate pace for the course -Ability to interact with the classroom group -Quality of individual relationships with students -Dynamism and enthusiasm of the teacher	-Following the progress of students -Stimulate questions and discussion -Respect the students -Enthusiasm of the professor -Intellectual motivation of the students	-Ability to interact with the classroom group
Learning assessment	-Relevant, clear, and objective exams -Allocation of fair grades	-Impartiality and equity of the professor's judgment -Quality of the feedback provided to students	-Several means of evaluation -Allocation of fair grades -Supervision of student learning -Feedback on the students' work
Subject matter knowledge	-Broad knowledge of professors in reference to the subject taught	Knowledge of the subject by the professor	
Impact of the course	-Value of learning undertaken by the students - Impact of the education.	-Value of the course for training	-Assessment of the students of learning and of progress made.

Source: Authors.

Assessment Itself

Advancing with the presentation of research at the undergraduate level, it should be noted that studies on the evaluation of teaching effectiveness, taking into account the student perception, are varied; as Marsh (1982) indicates: ...these scores are difficult to validate because there is no universal criterion (...) if the quality indicators and the scores of the students agree with some other measure of teacher effectiveness, then there will be grounds for defending the validity.

It must be ensured that the measurement is technically acceptable, feasible, reliable, and

Jesús Gabalán-Coello, Fredy Eduardo Vásquez-Rizo, Michel Laurier

valid, only then can it be used in making decisions or drawing conclusions. The data should be statistically evaluated with the purpose of removing inconsistencies (Emery et al., 2003).

Furthermore, it must be ensured that the system used throughout the process will meet the educational standards. This is a very complex topic, which requires total attention and consideration en relation with all existing legislative education levels. Studies about the topic have been addressed by Kaplin & Lee (1995), Braskamp & Ory (1994), and Centra (1993).

This legal aspect should necessarily be considered in the context of the new models of teaching and learning processes implemented in academic modernization, which this year takes part, with the intention of forming, not only professionals in specific areas of knowledge, but also individuals with clear humanistic and creative training (Dužević & Čeh-Časni, 2015). This implies that the teacher is involved with the student beyond simply curricular activities and becomes permeable to the perception of his or her students, all within the framework of the legality of his or her actions.

This is why it is convenient to analyze this type of variables in the process of teacher assessment, review the constants and distinct relationships that occur during the instructional process, many of them daily tasks outside of the classroom.

Some authors, such as Fuentes (2003), and Gabalán & Vásquez (2008), have analyzed these interrelations in different ways: first, relying on the Data Envelopment Analysis tool (DEA), implemented in questionnaires used to evaluate the professors of a Mexican university. Here they asked the students that provided additional information, outside their classroom, and who had some influence on their perception of the learning process. The quantitative contribution of the project conducted manifested itself through the implementation of a logistic regression with a binary dependent variable that allowed a relation of the different variables with teacher performance.

Meanwhile, the other two others established a mathematical model, taking as a reference the level undergraduate student perceptions, many of them outside the classroom. They used opinion questionnaires and group interviews, through which it was found that in approximately half of the cases, the overall score was explained by the variation of each one of the items of the questionnaire base, a situation that involved the analysis of external factors that were not taken into account in the questionnaire. Such relevant aspects were identified as: the level of empathy with the professor, the number of teachers throughout their educational process, teaching work experience (practice), complexity of the subject, the student's learning ability, etc.

As it becomes evident, it is worthwhile to look into these external aspects, while recognizing the intrinsic usual training process. The specific interest of this study is manifested through the following guiding question: what is the relationship between the variables associated with the traditional activities of teaching and students' perception about a teacher in qualifying which it is given at the end of a course?

Methodology

Next the deployment is performed that can answer the question raised. To do this, we want to obtain an unbiased or adjusted estimate of the relationship between the dependent variable (overall performance of the teacher-P14) and independent variables (related to the professorial exercise-P4 to P13). This questionnaire has 11 items around teacher performance and also has a last question that synthesizes the student´s perception about general performance of their professors involved. For this, the following methodological scheme is performed.

Population and Sample

The study considers the courses taught during the years 2014, 2013 and 2012, seeking to monitor trends and patterns in the perceptions of students. In education, one should measure and integrate information that is accessible, understandable and, above all, comparable (Shavelson, 2008). In this sense, specific measures are established, in which these courses have been under observation and investigation by the institution, with the application and systematization of the opinion questionnaire review the questionnaire for the development of courses.

We work with 6406 courses (all of them in undergraduate level) in the following specific areas: automation and electronics, energy and mechanical engineering, operations and systems, educational innovation in engineering, management science, economics, entrepreneurship, environmental sciences, physics, mathematics, science communication, advertising and design, language, social sciences, humanities and languages.

Criterion

The technique developed in this section serves institutional criteria. A bisection of the variables is performed, leaving results in two categories for each question. The university expects, as a "desirable outcome" that at least 80% of the perceptions of students are at levels 4 and 5. As this way, you can understand a dichotomous situation:

In this regard, some professors are given the code of 0, whom have been determined as underperforming by the question at hand through the quality threshold defined in the institution. In the opinion questionnaire they were asked about the variables related to the perception of students on teacher performance. Some of these statements are taken into account in the valuation of each question:

$$Si \ \frac{\sum_{j=4}^{5} Perc_j}{N} \geq 80\% = Performance 1$$

$$Si \ \frac{\sum_{j=4}^{5} Perc_j}{N} < 80\% = Performance 0$$

Where:

$Performance 1$ = performance equal to or superior to the defined quality standard

$Performance 0$ = performance below the defined quality standard

$Perc_j$ = number of perceptions given by students in category j.

N = Total number of students who answered the question.

The Use of the Questionnaire

The instrument, "opinion questionnaire on the development of the courses," conforms, from a methodological point of view, with the following phases: definition and operationalization of the concepts of the survey, questionnaire design (building questions and arranging them neatly), sample design, field work, and survey record. The information derived is the input for the analyzes conducted from a quantitative perspective, using the methods of multivariate analysis, understanding the quality of teaching as a factor that must be analyzed and interpreted across multiple dimensions, and converging both aspects of the teaching exercise, internally and externally.

Categories

The assessment categories for each question are:

1. DO NOT COMPLY with ANY of the issues submitted for consideration.

2. DO NOT COMPLY with the MAJOR-ITY of the aspects, or it is done in a very deficient manner.

3. It meets most aspects, but with significant shortcomings.

4. It properly complies with desirable aspects, although some adjustments are needed to obtain the best results.

5. It complies with a very good quality with the aspects and the margin for improvement is very much reduced and insignificant.

The variables used for the opinion questionnaires are universally accepted by the scientific community on this issue: compliance and institutional commitment, methodology, disciplinary domain, evaluation, and interpersonal relationships.

Questions

Each variable is broken down into questions in brackets (Table 2):

Table 2. *Questions of the applied instrument*

Question	Item
P4	The professor demonstrates, in performance, planning and preparing his or her classes, that he or she is orderly and systematic in their development.
P5	The professor demonstrates, in the management of academic discourse and confidence with which he or she answers the questions, mastery over the field of knowledge of this subject.
P6	The professor uses various strategies to motivate his or her students and maintains an appropriate climate for learning.
P7	The methodologies used by professor promote individual and collaborative work, inside and outside of the classroom.
P8	The professor develops themes clearly and coherently, in a way that facilitates understanding their approaches and follow the instructions set for the development of the course.
P9	In developing the course, the professor uses and encourages the use of technology and teaching tools to enhance the learning for students.
P10	The professor has a positive attitude towards the students, paying attention to their concerns and interests.
P11	The professor, in the development of the course, achieves the permanent use of physical or electronic library resources by students.
P12	The professor clearly and transparently explains criteria for the course evaluation. He or she clarifies the type of evaluation conducted; content, tools and strategies will be present in the evaluation process.
P13	The professor uses assessment to improve student training. For this purpose, he or she strives to take advantage of every moment of assessment in order to notice the areas requiring further attention and effort by students.
P14	Level of satisfaction of the work done by the teacher.

Source: Authors.

The Model

The logistic model (Logit) directly gives the probability of belonging to each of the groups (teachers valued according to the institutional quality standard and teachers who do not hold this assessment). Here we must transform the response variable to ensure that the expected answer is between 0 and 1. It is worth noting that subindex i refers to the case, the individual

or observation i in the database. Thus, if you take: $p_i = F(\beta_0 + \beta_1' x_i)$, it ensures that p_i is between 0 and 1, if F is required to have that property.

The class of nondecreasing functions, bounded between 0 and 1, is the class of distribution functions, whereby the problem is solved taking as any distribution function F. F is usually taken as the logistic distribution function, given as:

$p_i = \dfrac{1}{1+e^{-\beta_0+\beta_1'x_i}}$. This function has the advantage of being continuous. Furthermore as, $1-p_i = \dfrac{e^{-\beta_0+\beta_1'x_i}}{1+e^{-\beta_0+\beta_1'x_i}} = \dfrac{1}{1+e^{\beta_0+\beta_1'x_i}}$ it follows that $g_i = \log\dfrac{p_i}{1-p_i} = \beta_0 + \beta_1'x_i$, so that, to make the transformation, we have a linear model which is called Logit.

The variable g represents, on a logarithmic scale, the difference between the probabilities of belonging to both populations and, being a linear function of the explanatory variables, facilitates the estimation and interpretation of the model.

Thus, comparing with $g_i = \log\dfrac{p_i}{1-p_i} = \beta_0 + \beta_1'x_i$ the ordinate at the origin, β_0 is equal to $\beta_0 = -\dfrac{1}{2}\omega'(\mu_1 + \mu_2)$, where $\omega = V^{-1}(\mu_1 - \mu_2)$, and the slope vector is $\beta_1 = \omega$.

The model parameters are: β_0, the ordinate at the origin, and $\beta_1 = (\beta_1,...,\beta_k)$. Sometimes also used as parameters are $\exp(\beta_0)$ and $\exp(\beta_i)$, which are called the odds ratios or probability ratios. These values indicate how much the probability per unit change in the variable x is modified. In fact, from $g_i = \log\dfrac{p_i}{1-p_i} = \beta_0 + \beta_1'x_i$ is deduced from $O_i = \dfrac{p_i}{1-p_i} = \exp(\beta_0)\prod_{j=1}^{k}\exp(\beta_j)^{x_j}$.

Suppose that we take two elements that have equal values in all of the variables but one. They are $(x_{i1},...,x_h,...,x_k)$ the values of the variables for the first and $(x_{j1},...,x_h,...,x_k)$ for the second element, and all variables are the same in both elements less in the variable h where $x_{ih} = x_{jh} +1$. Then, the odds ratio for these two observations is: $\dfrac{O_i}{O_j} = e^{\beta_h}$, and indicates how much the odds ratio changes when the variable $p_i = 0$ increases by one unit.

If you consider $p_i = 0,5$ in the Logit model, then $\log\dfrac{p_i}{1-p_i} = \beta_0 + \beta_1 x_{1i} +...+ \beta_k x_k = 0$, that is to say,, $x_{1i} = -\dfrac{\beta_0}{\beta_1} - \sum_{j=2}^{k}\dfrac{\beta_j x_j}{\beta_1}$, when x_{1i} represents the value of x_1 which also makes it likely that an element whose remaining variables are $x_{2i},...,x_k$, belonging to the first or second population.

Results

Institutional Focus

The analysis of Binary Logistic Regression (BLG) allows association measurements (OR) for each variable adjusted for others and possible interactions between them and the effect studied. The BLG tests multiple possibilities to retain the most predictive (which has a lower standard error and a higher coefficient of determination), and which involves the fewest variables.

Within this analysis, for example (Table 3), if the P4 variable (the professor shows in their performance, planning and preparation of their classes, it is orderly and systematic in their development) associated with the variable P14 (satisfaction with the work done by the professor), you can set the proportion of students who have a good perception of their professor, generally higher in the students who give a good assessment in P4, than those who do not (p associated with 0.000).

Table 3. *Contingency table P4 and P14*

		P14bin		Total
		,00	1,00	
p4bin	,00	886	185	1071
	1,00	661	4674	5335
Total		1547	4859	6406

Source: Authors.

On the other hand, following the example, you can also determine the strength of this association from 33.86, which represents that the possibility of influence of these said students through this said question, in the final assessment it is greater than those who do not give a good rating. Put another way: positively rating the teacher in P4 increases the possibility of having a favorable perception of the overall performance of the teacher by 34, P14 (Tables 4 and 5).

Table 4. *Test Chi. Chart for P4 and P14*

	Value	df	Asymp. Sig. (2-sided)	Exact Sig. (2-sided)	Exact Sig. (1-sided)
Pearson Chi-Square	2408,994[a]	1	,000		
Continuity Correction[b]	2405,155	1	,000		
Likelihood Ratio	2099,440	1	,000		
Fisher´s Exact Test				,000	,000
Linear-by-Linear Association	2408,618	1	,000		
N of Valid Cases	6406				

a. 0 cells (,0%) have expected count less than 5. The minimum expected count is 258,64.
b. Computed only for a 2x2 table.
Source: Authors.

Table 5. *Risk analysis for P4 and P14*

	Value	95% Confidence Interval	
		Lower	Upper
Odds Ratio for p4bin (,00 / 1,00)	33,865	28,339	40,468
For cohort p14bin = ,00	6,677	6,186	7,207
For cohort p14bin = 1,00	,197	,173	,225
N of Valid Cases	6406		

Source: Authors.

Table 6. *Analysis dependencies between P3 - P13 and P14*

	Favorable P14	Pearson Chi-Square	Sig.	Odds Ratio (0.00/1.00)
P4	17-88	2408.99	0.00	33.86
P5	15-88	2498.48	0.00	39.26
P6	33-94	2753.64	0.00	33.17
P7	28-92	2740.07	0.00	30.55
P8	24-92	2973.21	0.00	37.52
P9	32-91	2319.58	0.00	21.48
P10	23-90	2571.53	0.00	29.54
P11	28-91	2490.45	0.00	25.06
P12	20-90	2824.21	0.00	36.85
P13	25-91	2688.71	0.00	30.02

Source: Authors.

When performing the exercise with all the questions in the questionnaire (Table 6), and considering an initial approximation through a bivariate relation (which, while not a final judgment given the possible intermediary variables, whether it may constitute an input in terms to identify relationships between the questionnaire and the perception overall), we can see that the general perception is related to all the questions in the questionnaire. However, it is necessary to note that the question that most influences a final decision regarding the performance of the teacher is P5 (the teacher demonstrates, in the management of academic discourse and confidence with which he or she answers questions, mastery over his or her field of knowledge of this subject).

From this same perspective, it is established that the question which has less influence on the final qualification of the teacher is P9 (In developing the course, the teacher uses and encourages the use of learning tools and technology for enhancing student learning).

While the above process identifies one on one relationships between the independent variables and the variable of general perception, it is important to supplement the study with the construction of an analytical model that leads to an exploration, from a multivariate perspective,

of how all the variables are interrelate, since the process of evaluation and assessment of the professor's performance is holistic, integrative, and systemic. This necessarily requires analysis from the institution as a whole, considering a student's perceptions as the center of this analysis. To do this, you must make use of all of the information on the courses, i.e. from 6406, which has the perception of students, all the courses of the institution within the observation window (years 2012, 2013, and 2014).

In this manner, in the response variable, the value of 0 is assigned to the questions that, on average, obtain a perception by the students that is below the standard predefined quality (less than 80% of students give a score that is between 4 and 5). In the same direction, the value 1 is assigned to those questions in which the average teacher is within the standard for quality defined by the university (equal to or greater than 80% of students give an assessment between 4 and 5). The reverse occurs in the independent variables.

Based on the Omnibus test, Binary Logistic Regression presents an appropriate adjustment (sig. 0.000). For building the logistical model the method employs the forward strides of Wald, by performing the subsequent iterations.

Table 7. *Summary of the models*

Step	-2 log verisimilitude	R Cox and Snell	R Nagelkerke
1	4343,624	,348	,520
2	3593,132	,420	,628
3	3267,138	,449	,671
4	3081,358	,465	,694
5	2975,134	,473	,708
6	2900,049	,479	,717
7	2846,465	,484	,723
8	2804,848	,487	,728
9	2787,225	,489	,730
10	2776,272	,489	,732

Source: Authors.

Jesús Gabalán-Coello, Fredy Eduardo Vásquez-Rizo, Michel Laurier

According to the goodness of fit, we decided to work with the resulting model in step 10. In this regard, the change in the general perception of the professor's general performance is explained largely by the perceptions associated with the questions considered in the model of step 6 (Table 7).

It is therefore important to note that in this passage (10), 73.2% (Nagelkerke R Square) of the variation in the dependent variable or response (overall perception of the professor performance variable grouped into two categories: equal or superior to the institutional standard or below the institutional standard of quality) quality depends on the variation of the independent variables (P4-P13), grouped into two categories: at or above the standard for institutional quality, or inferior to the institutional standard quality (Table 8). This relates to the findings by Gabalán & Vasquez (2008), in which, through a model, discriminating analysis made it possible to identify that half of the explanation for the variable of the professor's overall performance should be addressed through technical qualitative research.

Table 8. *Variables of the binary logistic equation, for step 10*

		B	E.T.	Wald	gl	Sig.	Exp(B)
	P4BIN(1)	-,561	,139	16,196	1	,000	,571
	P5BIN(1)	-,774	,142	29,883	1	,000	,461
	P6BIN(1)	-1,040	,117	79,488	1	,000	,354
	P7BIN(1)	-,760	,118	41,294	1	,000	,467
	P8BIN(1)	-1,116	,115	93,587	1	,000	,328
Paso 10	P9BIN(1)	-,401	,120	11,215	1	,001	,670
	P10BIN(1)	-,787	,122	41,382	1	,000	,455
	P11BIN(1)	-,851	,117	53,253	1	,000	,427
	P12BIN(1)	-,872	,125	48,693	1	,000	,418
	P13BIN(1)	-,716	,119	36,084	1	,000	,489
	Constante	3,707	,086	1864,413	1	,000	40,722

Source: Authors.

As shownthe weightings are highly significant, ie, that there is indeed an increase in the response variable from the changes in the questions.

That is:

$$Logit(p) = 3.707 - 0.561(P4) - 0.774(P5) - 1.040(P6) - 0.760(P7) - 1.116(P8) - 0.401(P9) - 0.787(P10) - 0.851(P11) - 0.872(P12) - 0.716(P13)$$

Still $Logit(p) = Ln\left(\frac{p}{1-p}\right) = Ln(Odds)$. And in which $p = P[Y = 1]$, that is, the probability that an individual has evaluated the characteristic.

In this case, the positive perception of the overall performance of the professor about his or her teaching work by students.

Or alternatively:

$$\frac{1}{1+e^{-(3.707-0.561(P4)-0.774(P5)-1.040(P6)-0.760(P7)-1.116(P8)-0.401(P9)-0.787(P10)-0.851(P11)-0.872(P12)-0.716(P13))}}$$

It is worth mentioning that for the independent variables, category 0 represents the fulfillment of the quality criteria. I.e., positive values in the response variable imply model forecasts toward the group of professors who meet the criteria of institutional quality.

Table 9 presents the classification matrix for this model. It can be seen that professors who, in their general perception, obtained an assessment below the standard of quality, are properly classified by the model, 77% of the time, and that teachers who obtain, at a general level, a good assessment, are well qualified by 96%.

Table 9. *Variables of the binary logistic equation, for all steps - classification matrix*

	Observed		Forecast		Correct percentage
			P14BIN		
			,00	1,00	
Step 1	P14BIN	,00	1178	369	76,1
		1,00	381	4478	92,2
	Overall percentage				88,3
Step 2	P14BIN		1067	480	69,0
			191	4668	96,1
	Overall percentage				89.5
Step 3	P14BIN	,00	1216	331	78,6
		1,00	299	4560	93,8
	Overall percentage				90,2
Step 4	P14BIN	,00	1082	465	69,9
		1,00	148	4711	97,0
	Overall percentage				90,4
Step 5	P14BIN	,00	1213	334	78,4
		1,00	261	4598	94,6
	Overall percentage				90,7
Step 6	P14BIN	,00	1190	357	76,9
		1,00	217	4642	95,5
	Overall percentage				91,0
Step 7	P14BIN	,00	1157	390	74,896,4
		1,00	177	4682	91,1
	Overall percentage				
Step 8	P14BIN	,00	1218	329	78,7
		1,00	221	4638	95,5
	Overall percentage				91,4
Step 9	P14BIN	,00	1192	355	77,1
		1,00	197	4662	95,9
	Overall percentage				91.4
Step 10	P14BIN	,00	1189	358	76,9
		1,00	203	4656	95,8
	Overall percentage				91,2

Source: Authors.

Finally, you can establish that the overall percentage of the classification model is 91%. This implies that the weights assigned to the questionnaire are adequate and largely serve to predict the behavior of the response variable (general perception of the professor's performance).

The Disciplinary Approach

To complement the study, it is worth it to also conduct an analysis by using the disciplinary approach, given that it is possible that there are particular situations within each specific area (Table 10). This distribution by areas is

performed because, in many cases, the educational process presents hierarchical structures, where students within the same area share certain characteristics and educational experiences that influence their way of seeing the learning process and its performance in curricular and curricular elements, which makes them similar (López, 2012).

Table 10. *Odds ratio between the independent variables (P4-P13) and the dependent variable (P14) for core subjects (specific areas)*

Area	P4	P5	P6	P7	P8	P9	P10	P11	P12	P13
Automation and Electronics	48,98	59,56	24,54	36,17	114,86	19,77	29,99	29,82	38,65	25,83
Energy and Mechanics	63,27	57,19	35,20	26,72	52,49	41,48	56,71	30,30	69,97	52,22
Operations and Systems	30,07	29,97	33,42	26,76	36,50	21,25	12,79	18,81	24,40	16,17
Educative Innovation in Engineering	27,38	44,70	23,18	31,77	39,17	15,91	15,91	19,80	18,35	14,56
Administrative Sciences	45,14	34,24	24,27	21,63	31,85	27,93	33,55	21,21	34,44	28,88
Economical Sciences	34,80	43,50	38,86	43,12	58,41	29,99	29,31	31,54	60,26	43,59
Entrepreneurship	40,50	8,44	63,00	63,00	83,57	63,00	27,15	45,00	83,57	53,38
Environmental Sciences	22,06	43,60	40,00	30,49	34,71	18,10	56,88	16,63	52,56	16,82
Physics	89,00	32,63	32,93	25,44	195,89	8,98	28,33	20,00	25,04	23,43
Mathematics	18,27	28,44	33,40	32,31	34,06	14,02	28,55	20,50	26,85	21,17
Communication Sciences	21,63	29,39	28,33	14,09	21,13	22,10	16,48	21,42	29,00	25,37
Advertising and Design	30,71	48,13	34,95	32,66	28,24	26,32	40,30	30,26	39,11	36,13
Language	83,42	62,29	40,12	47,30	30,18	21,70	58,29	38,00	39,01	33,60
Social Sciences	11,32	10,13	24,36	31,56	11,35	72,00	30,38	14,64	23,52	17,96
Humanities	27,47	30,67	27,31	25,58	28,17	19,23	36,92	17,61	29,64	43,81
Languages	90,01	61,44	42,34	37,54	29,81	35,95	35,31	77,04	33,83	38,97

Source: Authors.

Based on this table, it can be inferred that:

-For the Engineering subjects, specifically those related to automation and electronics, and systems and operations, develop the topics in a clear and coherent manner has a great weight on the overall assessment. In those subjects related to energetics and mechanics, the explanation with clarity and transparency the criteria for the evaluation of the course, on the part of the professor, is a factor that positively influences in the assessment of its final performance (P14).

-According to the basic sciences, the most important thing about the teacher´s performance (in physics and mathematics) is to develop the topics in a clear and coherent way. It is worth noting that an adeccuate value in this item (according to student´s appreciation) multiplies in 195.89 times, the probability that the professor has a favorable perception, at a general level.

- In relation to the subjects associated with the economic sciences, the question that has a greater impact on the overall assessment is: the professor shows planning and preparation of his/her classes. And for the administrative sciences: the professor explains the criteria for the assessment of the course with clarity and transparency.

- In humanities courses, if the professor uses the assessment as a tool to improve the learning of his or her students, it is highly likely that you will have a favorable perception at the end of the course.

- The variable that presents the greater positive impact (it appears a greater number of times) is if the professor develops the issues clearly and consistently (makes it easier to follow the instructions that set for the development of the course). For instance that situation is presented in subjects related with automation and electronics, physics, mathematics, operations and systems, and entrepreneurship.

- Whether the teacher uses and encourages the use of teaching tools and technology or not to enhance learning of students, it doesn´t seem to be relevant in terms of the final perception. That fact is confirmed in subjects related to: automation and electronics, physics, mathematics, language, and, finally, advertising and design (less weight in the model).

Discussion

About the Pedagogical Qualification-Discipline

Although the pedagogical guidelines are horizontal; it would be important to involve the pedagogical discipline notion as a mechanism to establish the pedagogical dialog from the discipline, i.e. find the routes of transmission of knowledge from the discipline and for learning in the discipline. It is possible to oppose this postulate, recognizing that, for example, the engineering has its own forms, backed up by the context and to promote a better learning of concepts in virtue of its theoretical component-practical; as well as the humanities and the discursive phenomenon around the same epistemological issues may contain a particular pedagogical fabric.

Adjacent Aspects

It is impossible to think the act of transmission of knowledge as an isolated phenomenon. Therefore, the educational work is trained not thinking in the same pedagogy. The expertise of the professor, the exposure in disciplinary contexts, as well as the same interpersonal relations are the fertile soil in which the transmission becomes effective. For instance, related studies reflects the importance to consider the link between teaching and research as adjacent aspects (Visser-Wijnveen et al., 2016), with positive outcomes in teaching-learning process. In this sense, the programs of institutional educational qualification could consider in addition to the generic and cross-sectional or specific skills associated with the context of the areas, the path to the professor in the business sector, etc.

On the Depth of the Assessment

Studies presented on the valuation of the dynamic scholarly rigor relate to quantitative methods, in both these allow the description and explanation of educational phenomena; in other words deal with the "what". Good part of these studies recognizes that the models do not explain all the variation in the dependent variables. To this extent, there are external elements that are taken into account by those involved (whether students, teachers, managers, etc.) and that are more about the attitudinal and framework of understanding of the phenomenon of each individual. This is necessary, in-depth study of assessment of the performance of the professor from a more qualitative aspect which can respond to the "why".

Conclusions

It is important to note that the study allows you to identify trends on the perception of the teaching performance by the students. In this sense, it can be seen an improvement in the quality of the teaching staff (in terms of the students perceptions). On average, the majority of

the courses you will find several points above the threshold of quality institutionally defined.

An approximation of the influence of the questions in the final assessment. This introduces an important element, since it can be proved that the related condition if the teacher demonstrates, in the management of their academic discourse and in the safety with which responds to the questions, domain on the field of knowledge of this subject represents a strategic point to make a value judgment on a general level.

In parallel, it is noted that at the level of groups of subjects (specific areas), it becomes a variable, consisting for several cases, if the teacher develops the issues clearly and consistently. This, without a doubt, is related to the one identified in the institutional approach with regard to the domain, disciplinary, and pedagogical.

On the other hand, the questionnaire applied to the students collects much of the variation on the overall performance. This fact generates as a related conclusion, the validation of questionnaire through the time, involving questions that are relevant to the current realities of the institution.

Future studies on the subject could be made from an analysis involving qualitative research techniques as a mechanism for ensuring the depth and the search for specific guidelines about the ways that occur in practice in the institutional pedagogic processes. From this same perspective, it is recommended that scholars explore from impact evaluation methodologies, which is the specific effect of the evaluation provided to teachers in improving the quality of the teaching processes, research, and social outreach.

References

Avalos, B., & Assael, J. (2006). Moving from resistance to agreement: the case of the Chilean teacher performance evaluation. *International Journal of Educational Research, 45*(4-5), 254-266. https://doi.org/10.1016/j.ijer.2007.02.004

Braskamp, L. A., & Ory, J. C. (1994). *Assessing faculty work: enhancing individual and institutional performance.* San Francisco, CA: Jossey-Bass Higher and Adult Education Series.

Centra, J. A. (1993). *Reflective faculty evaluation: enhancing teaching and determining faculty effectiveness*. Columbus, OH: Ohio State University Press.

Colby, S. A., Bradshaw, L. K., & Joyner, R. L. (2002). *Teacher evaluation: a review of the literature*. Retrieved from http://files.eric.ed.gov/fulltext/ED464915.pdf

Duževió, I., & Čeh-Časni, A. (2015). Student and faculty perceptions of service quality: the moderating role of the institutional aspects. *Higher Education, 70*(3), 567-584. https://doi.org/10.1007/s10734-014-9857-3

Emery, C. R., Kramer, T. R., & Tian, R. G. (2003). Return to academic standards: a critique of student evaluation of teaching effectiveness. *Quality Assurance in Education, 11*(1), 37-46. https://doi.org/10.1108/09684880310462074

Feldman, K. A. (1989). The association between student ratings of specific instructional dimensions and student achievement: refining and extending the synthesis of data from multisection validity studies. *Research in Higher Education, 30*(6), 583-645. https://doi.org/10.1007/BF00992392

Flores, M. A. (2012). The implementation of a new policy on teacher appraisal in Portugal: how do teachers experience it at school? *Educational Assessment, Evaluation and Accountability, 24*(4), 351-368. https://doi.org/10.1007/s11092-012-9153-7

Fuentes-Castro, H. J. (2003). La evaluación de la actividad docente: un análisis a partir de la técnica DEA [The evaluation of the teaching activity: an analysis based on the DEA technique]. *Economía Mexicana, 13*(1), 137-163. http://dx.doi.org/10.18041/entramado.2015v11n2.22216

Gabalán-Coello, J., & Vásquez-Rizo, F. E. (2008). Del otro lado de la pizarra: relación estudiante profesor desde perspectivas disciplinares [The other side of the blackboard: The student-teacher relationship from a disciplinary perspective]. *Revista Educación y Educadores, 11*(1), 103-126.

Kaplin, W. A., & Lee, B. A. (1995). *The law of higher education: a comprehensive guide to legal implications of administrative decision making* (3rd Ed.). San Francisco, CA: Jossey-Bass.

López-Mera, S. F. (2012). Estimación del efecto colegio en Colombia: 1980 – 2009 [Estimating the school effect in Colombia: 1980 – 2009]. *Estudios Gerenciales, 28*(122), 49-68. https://doi.org/10.1016/S0123-5923(12)70193-6

Marques-Graells, G. P. (2000). *Evaluación contextual. Cuestionarios para la evaluación del profesorado [Contextual evaluation. Questionnaires for teacher evaluation]*. Retrieved from http://peremarques.pangea.org/contextu.htm

Marsh, H. W. (1987). Students´ evaluation of university teaching: research findings, methodological issues, and directions for future research. *International Journal of Educational Research, 11*(3), 253-288. https://doi.org/10.1016/0883-0355(87)90001-2

Marsh, H. W. (1982). Validity of students evaluations of college teaching a multirate multimethod analyse. *Journal of Educational Psychology, 74*(2), 264–279.

Ovando, M. N., & Ramírez, A. (2007). Principals' instructional leadership within a teacher performance appraisal system: enhancing students' academic success. *Journal of Personnel Evaluation in Education, 20*(1-2), 85-110. https://doi.org/10.1007/s11092-007-9048-1

Shavelson, R. J. (2008). *La medición como una manera de expresar la evaluación del estudiante: sus posibilidades y limitaciones [Measurement as a way of expressing the student's assessment: Its possibilities and limitations]*. Retrieved from http://dewey.uab.es/http://www.colombiaaprende.edu.co/html/mediateca/1607/article-175477.html

Stronge, J. H. (2006). *Evaluating teaching. A guide to current thinking and best practice.* Thousand Oaks, CA: Corwin Press.

Stronge, J. H. (1995). Balancing individual and institutional goals in educational personnel evaluation: a conceptual framework. *Studies in Educational Evaluation, 21*(2), 131-151.

Stufflebeam, D., & Shinkfield, A. (2007). *Evaluation theory, models, and applications*. San Francisco, CA: John Wiley.

Visser-Wijnveen, G. J., Van der Rijst, R. M., & Van Driel, J. H. (2016). A questionnaire to capture students' perceptions of research integration in their courses. *Higher Education, 71*(4), 473-488. https://doi.org/10.1007/s1073

Sanders, W. L., Horn, S. P., & Wright, S. P. (1997). Teacher and classroom effects on student achievement: implications for teacher evaluation. *Journal of Personnel Evaluation in Education, 11*(1), 57-67. https://doi.org/10.1023/A:1007999204543