Confirmatory Factor Analysis of the Assessment Instrument Teacher of the Escuela Politécnica National

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***Abstract*– This work carries out the Confirmatory Factor Analysis of the teaching evaluation instrument of the National Polytechnic School of 14 items; the database used was 3072 records previously cleared for inconsistency and stereotyped responses. The result of the described method is a model that partially adjusts to the data, so an alternative model was proposed that includes new relationships between parameters, obtaining an improvement in the model's adjustment criteria.**

***Keywords*— Confirmatory Factor Analysis, Generalized Minimum Squares, Global Adjustment Factors, Parsimony.**

***Resumen*– Este trabajo realiza el Análisis Factorial Confirmatorio del instrumento de evaluación docente de la Escuela Politécnica Nacional de 14 ítems, la base de datos utilizada fue de 3072 registros previamente depurada por inconsistencia y respuestas estereotipadas. El resultado del método descrito es un modelo que se ajusta parcialmente a los datos, por lo que se planteó un modelo alternativo que incluye nuevas relaciones entre parámetros, obteniendo una mejora en los criterios de ajuste del modelo.**

***Palabras Clave*—Análisis Factorial Confirmatorio, Mínimos Cuadrados Generalizados, Factores de Ajuste Global, Parsimonia.**

I. Introduction

The Confirmatory Factor Analysis (CFA) is a technique that evaluates measurement models, analyzes the relationship between the measures or indicators observed and latent variables or factors [1], which needs a robust underlying database and it may be necessary to a preliminary work as the Exploratory Factor Analysis (EFA) [2].

The EFA is the most widely used method for the removal of factors of a correlation matrix, analyzes the total variance of the set of observed variables and allows the reduction of these, obtaining the main components that define them, which explain the more significant percentage of variance of the scale of measurement and therefore contain the highest amount of information they bring to an assessment model [3].

Following article 151 of the "Ley Orgánica de Educación Superior" which provides that the teachers will be subjected to a comprehensive periodic assessment by the "Reglamento de Carrera y Escalafón del Profesor e Investigador del Sistema de Educación Superior" and the statutory rules of each University. The survey carried out by the students with their teachers will be considered as one of the parameters of evaluation of teaching performance. This comprehensive evaluation allows to enter as assistant professor or associate the University, obtaining a rating of at least 75% in the performance evaluation during their last two academic periods and to the full professors the opportunity to be promoted if they comply with at least an 80% in the performance evaluation during their last two academic periods [4].

It is part of the Exploratory Factor Analysis with Principal Components Analysis (PCA), a wide sample of data records from students and teachers of careers in engineering, science, and technology, the National Polytechnic School (EPN) of Quito. This research was conducted considering the requirements of reliability and validity of the questionnaire with Likert scales of opinion [5].

The AFE conducted with a sample of students of the academic period 2017-B (October 2017- March 2018), which allowed a considerable reduction of components of the assessment instrument to the original teaching of 33 items according to Tables 1 to 14 items as indicated in Table 2. Therefore, the questionnaire of 33 questions reduced to 14 without loss of validity or reliability with an Alpha of Cronbach $\alpha = 0.963$ and with the same informative value of the original evaluation instrument, thus reducing the number of factors or constructs of 5 to 3 [6].

Based on the reduced scale of 14 items, this research work, performs the confirmatory factor analysis with a sample of students and teachers of the academic period 2018-B (October 2018- March 2019), which allowed to contrast the model built in advance with a structure of hypothetical factors.

TABLE I
THE INSTRUMENT OF EVALUATION OF 33 ITEMS WITH FIVE CONSTRUCTS [6].

I	Didactics	IV	Evaluation Criteria
1	Did the teacher clearly explain the objectives and themes, indicating their interrelation and contribution to a professional profile?	17	Has the teacher used objective methods to evaluate students?
2	Did the teacher select class activities appropriately, depending on the objectives?	18	Has the evaluation been used to reorient student learning?
3	Has the teacher been clear in his/her explanations and exhibitions?	19	Has the professor considered aspects that have not been merely cognitive?

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4	Has the teacher related theoretical fundamental concepts and principles with practice?	20	Does the professor evaluate fairly and impartially?
5	Does the professor solve the difficulties that arise?	21	Has the minimum level to approval the course been explained, and why?
6	Does the teacher show the mastery of the subject?	22	Were the objectives defined in a clear and concise form?
7	Does the lecturer demonstrate planning his/her lectures before the class presentations?	23	Are the evaluation events related to the teaching taught?
8	Is the teacher creative and dynamic in the classroom?	**V**	**Teacher-Student Relationship**
9	Does the teacher show that he/she is up to date on the subject he teaches?	24	Did the teacher ascertain that the students understand what he taught?
II	**Resources**	25	Did the teacher encourage the initiatives coming from the students?
10	Does the teacher prepare didactic material additional to the textbook and made itself known?	26	Did the teacher create an environment of participation?
11	Does he organize didactic experiences such as visits, excursions, projects, discussions?	27	Did the teacher maintain a cordial relationship with the entire group of students?
12	Has the complementary, recommended, or used material been interesting?	28	Did the teacher create an environment of trust and work during class?
13	Does he use means that benefit the learning process?	29	Has the teacher motivated students and increased their interest in the subject?
III	**Methodology**	30	Does the teacher have an attitude of availability outside of class?
14	Did the teacher use different teaching methods properly?	31	Does the teacher openly accept the suggestions made by students?
15	Have the teacher used a varied methodology?	32	Was the teacher worried about the evolution of the students?
16	Has the teacher explained the methodologies for evaluating the course?	33	Excluding limitations that are not due to the teacher, could he/she be considered as a good teacher?

TABLE II
THE INSTRUMENT OF EVALUATION OF 14 ITEMS WITH THREE CONSTRUCTS [6].

I	**Class Planning and Development**
1	Do the syllabus, teaching methodology, and learning outcomes of the subject explain at the beginning of the period?
2	Do you show that you prepare and plan your classes (activities, methodologies, resources, evaluation, etc.)?
3	Is it clear in your presentations and explanations, and do you understand the topics taught?
4	Does it show mastery of the topics discussed in class?
5	Does it meet the established class schedule?
6	Do the methodology and teaching resources used facilitate the understanding of the subject?
7	Do you use teaching experiences such as visits, excursions, projects, discussions, exercises, workshops, etc.?
8	Does it relate the contents of the subject to the career profile and encourage interest in it?
II	**Evaluation**
9	Are evaluation events related to the topics covered in the course?
10	Does it comply with the weighting of the evaluation events established by the institution and contemplated in the syllabus?
11	Do you adhere to the review of tests and/or exams before the registration of grades?
III	**Professor-Student Relationship**
12	Does it generate a climate of respect, trust, participation, and work in the classroom?
13	Do you meet out-of-class consultation hours?
14	Do you consider yourself a good teacher?

II. METHOD

A. *Participants*

The sample examined corresponds to 1187 students enrolled that generate 3072 records of data analyzed, which evaluated their teachers in the academic period 2018-B (October 2017 - March 2018), belonging to 20 careers in science, engineering, and technology. The population includes 29.49 percent of women and 70.51 percent of men. The sample of 3072 records chosen from an original database of 6974. Established the presence of a population of 155 teachers, of which 24.52% were women and 75.48% men.

B. *Measurements*

After the exploratory factor, analysis, with the removal of principal components in which a survey of 14 items accomplished in the confirmatory factor analysis, with the sample described in section A and the instrument for assessing the teaching of 14 questions, which consists of three constructs. Two measures are taken, in the middle, and at the end of the academic period, students must assess their teachers, with the help of a computing platform that guarantees the validity and sequence of the obtained data. It decided to opt for the analysis of the database obtained at the end of the academic term because students who completed evaluate teacher performance with a complete view acquired during the course. The identity of the respondents is anonymous, and they distinguished by the unique number assigned to each one at the time of their first enrollment at the university. The data on gender, age, race, class, course, etc., were obtained from records of the computing platform provided by the university to the researcher. The academic authorities of the EPN establish all the parameters used in this research.

C. *Procedure*

Uses the IBM SPSS statistical software AMOS 24 structural equation modeling to perform the confirmatory factor analysis, which presents a graphic display several stages. It starts with the observed variables that represent the items or questions on the survey of the model to evaluate; that

is to say, the representation of the structure hypothesized that links the indicators with latent factors and the latter among themselves [7]; the next stage consists of factors (first-order), which are the independent variables in the model, for our case are Planning and Development of class, Assessment, and Relationship Teacher - Student. Of these three factors of the first order is obtained one of the second, which are two levels of variables measured [8], which explain the relationship between constructs. The model expresses the variables v1, V2, …, V14 in terms of first-order factors F1, F2, and F3 with their respective residual errors, e1, e2, …, e14. The factors F1, F2, and F3, are dependent on the higher-order factor are not correlated with each other, which presents the residual variables: Er1, ER2, and Er3. The higher-order factor F4 explains any correlation or covariance between the factors of the first order. Errors in the measured variables and factors of the first order, predict that part of the variance of each factor that is not explained by the higher-order factor [9].

Subsequently, assesses the fit of the data to the "Proposed Model." This allows analyzing the goodness and adequacy of the model with a group of observed measurements. There are three types of measures of global settings that examined: Absolute Measures of Adjustment, Incremental Measures of Adjustment, and Adjustment Measures in the Parsimony [10].

The main absolute measures of adjustment employed are Chi-square (x^2), Likelihood Ratio Chi-square test (p), Root Mean Square Error of Approximation (RMSEA), and Goodness of Fit Index (GFI). For Incremental Measures of Adjustment, it discusses the following: Comparative Fit Index (CFI), Toker Lewis Index (TLI), and Normed Fit Index (NFI). For the Parsimony-Adjusted Measures, we have the Relationship of Parsimony (PRATIO), Parsimony Comparative Fit Index (PCFI), Parsimony Normed Fit Index (PNFI) and the Akaike Information Criterion (AIC) [10]. Each of the measures referred to above allows us to test and examine relationships or complex models with graphic modeling by providing a clear understanding of the AFC because of the criteria or global measures necessary to check the setting of the "Proposed Model" [11].

D. Data Analysis

There are several methods of estimation and testing, which provides the software used: Maximum Likelihood (ML), Generalized Least Squares (GLS) and non-Weighted Least Squares (ULS). The estimator more used in this type of analysis is the ML, and an alternative to this estimator for normal and continuous data is GLS, which is a function of adjustment simple and produces approximately the same quality of adjustment that ML, especially when the sample size is significant [1].

The estimator applied to the Confirmatory Factor Analysis carried out with the questionnaire of 14 items is Generalized Least Squares that takes into account the large sample size. How to output values, are presented multiple correlations, indirect effects, direct and total factor of pesos, covariance, and correlation of estimates, rates of change and history of minimization; these values are obtained as a result of the analysis of the adjustment of the model and are presented in tables, as well as measures of the adjustment global also provide information relevant to establishing if the "Proposed Model" analyzed is reliable or not.

The criteria for setting the "Proposed Model," like the Chi-square likelihood ratio, Root Mean Square Error of approximation, Goodness of Fit, among others, have to comply with levels of acceptance explained in Table III.

TABLE III
MODEL ADJUSTMENT CRITERIA [11][12].

GLOBAL ADJUSTMENT MEASURES	MODEL ADJUSTMENT CRITERIA	ACCEPTABLE LEVEL	INTERPRETATION
Absolute Adjustment Measures	Chi-square	x^2	Compare x^2 with a given df [c] Table V
	Chi-square Likelihood Ratio (p)	>0.05	Good fit of the model.
	Root Mean Square Error of approximation (RMSEA)	<0.5	Good fit of the model <0.08 [12].
	Good of Fit Index (GFI)	[0, 1] [a]	A value close to 0.95 reflects a good fit.
Incremental Adjustment Measures	Comparative Fit Index (CFI)	[0, 1] [a]	A value close to 0.90 reflects a good fit.
	Toker Lewis Index (TLI)	[0, 1] [a]	A value close to 0.90 reflects a good fit.
	Normed Fit Index (NFI)	[0, 1] [a]	A value close to 0.90 reflects a good fit.
Parsimony-Adjusted Measures	Relationship of Parsimony (PRATIO)	[0, 1] [a]	Compare values in alternative models.
	Parsimony Comparative Fit Index (PCFI)	[0, 1] [a]	Compare values in alternative models.
	Parsimony Normed Fit Index (PNFI)	[0, 1] [a]	Compare values in alternative models.
	Akaike Information Criterion (AIC)	[0; negative value] [b]	Compare values in alternative models.

[a] 0: no adjustment; 1: perfect fit;
[b] 0: perfect fit; negative value: poor adjustment
[c] df: degrees of freedom

III. RESULTS

It has a total of 35 variables that make up the graphical representation of the "Proposed Model," as shown in Fig 1. Also, it notes the presence of different types of variables; for example, the endogenous variable F2 receives the effect of other variables such as F4 and Er2. Exogenous variables that affect other variables and receive no impact, for example, Er1

that affect F1 and are not affected by any other variable. On the other hand, the observed variables are variables that can be measured and are represented by rectangles; in this case, are 14 items or questions. Unobserved variables are the factors or constructs that represent abstract concepts such as F1 to F4, and the errors, are represented by circles or ellipses [13].

According to Table IV, there are 17 endogenous variables, 18 exogenous variables, and the observed variables are 14 and 21 variables not observed that correspond to the "Proposed Model" to be analyzed. It was obtained as minimum values achieved a Chi-square test x^2 = 1112.619 with 74 degrees of freedom and with a p = 0.000, as shown in Table V; also, it is noted that p is less than 0.05 and therefore does not meet the minimum acceptable level for a good fit of the model [11].

Cannot rely solely on the value of Chi-square since it is sensitive to the sample size, because as the sample size increases the value of x^2 tends to indicate a significant level of probability, in contrast to the extent that decreases the size of the indicator on x^2 suggests a level of probability not substantial [11]. For our case study, the sample size is 3072 records, for which it is necessary to supplement these measures with other absolute means of adjustment, which found in Tables VI and VII.

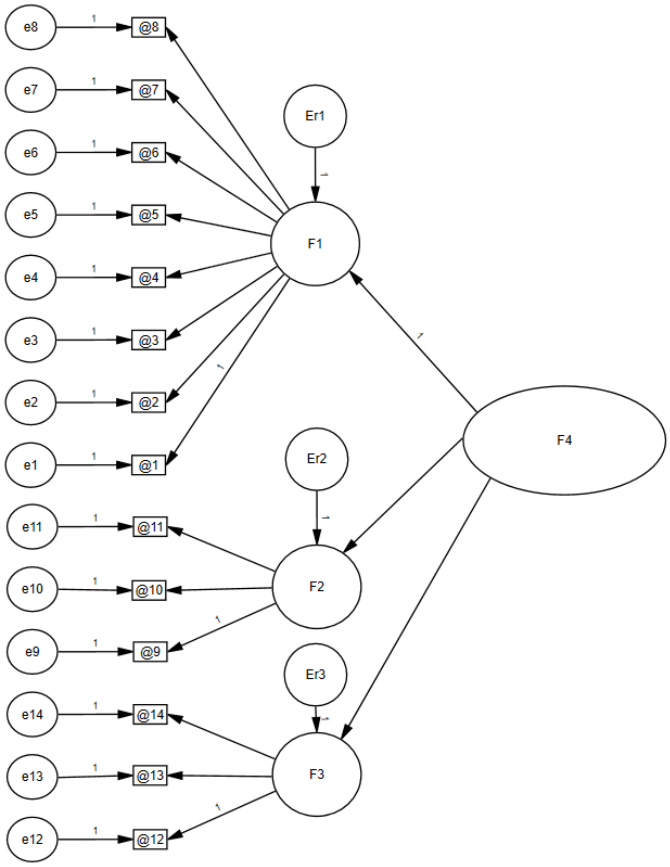

Fig. 1 Proposed Model of Teacher Evaluation.

TABLE IV
VARIABLES OF THE PROPOSED MODEL [AUTHORS]

VARIABLES NOT OBSERVED (ENDOGENOUS)	VARIABLES NOT OBSERVED (EXOGEN)
F1	e1
F2	e2
F3	e3
OBSERVED VARIABLES (ENDOGENS)	e4
@1	e5
@2	e6
@3	e7
@4	e8
@5	e9
@6	e10
@7	e11
@8	e12
@9	e13
@10	e14
@11	F4
@12	Er1
@13	Er2
@14	Er3

TABLA V
MINIMUM VALUE OF THE FUNCTION DISCREPANCY OF THE PROPOSED MODEL, CMIN [AUTHORS].

Model	NPAR	CMIN	DF	P	CMIN/DF
Default model	31	1112.619	74	.000	15.035
Saturated model	105	.000	0		
Independence model	14	2914.756	91	.000	32.030
Zero model	0	21497.000	105	.000	204.733

The Root Mean Square Error of Approximation suppresses the drawback to p when the sample is too large expresses the effect of the complexity of the model by dividing the number of degrees of freedom. The RMSEA = 0.068, according to Table VI, is less than 0.08, the minimum value set as an indicator for a good fit.

TABLA VI
RMSEA OF THE PROPOSED MODEL [AUTORES].

Model	RMSEA	LO 90	HI 90	PCLOSE
Default model	.068	.064	.071	.000
Independence model	.101	.097	.104	.000

The goodness-of-fit of a statistical model describes how well it fits a set of observations; these measures of goodness-of-fit tend to summarize the discrepancy between the values

observed and expected values in the model in question [11]. The index that measures the goodness of fit for our case is GFI = 0.948, whose value is next to the unit, as can be seen in Table VII.

TABLA VII
GFI OF THE PROPOSED MODEL [AUTORES].

Model	RMR	GFI	AGFI	PGFI
Default model	.032	.948	.927	.668
Saturated model	.000	1.000		
Independence model	.444	.864	.844	.749
Zero model	.494	.000	.000	.000

Incremental adjustment measures that are analyzed are IFC, TLI, and NFI, these socks are in Table VIII, which evaluates the fit of a model compared with another of reference nested more restricted, called "null model" where the covariance between all input indicators are set to zero [1]. In our case, NFI = 0.618, TLI = 0.548, CFI = 0.632, values that are found in the range average conclusive.

TABLA VIII
BASE COMPARISONS OF THE PROPOSED MODEL [AUTORES].

Model	NFI Delta1	RFI rho1	IFI Delta2	TLI rho2	CFI
Default model	.618	.531	.634	.548	.632
Saturated model	1.000		1.000		1.000
Independence model	.000	.000	.000	.000	.000

Ending the analysis assesses the Adjustment Measures in the parsimony, present in Table IX. These analyze the simplicity of the proposed model; it has criteria such as PRATIO, which relates the degrees of freedom of the proposed model with the degrees of freedom of the null model, the measure of PNFI, which is equal to PRATIO multiplied by NFI and PCFI criterion, which is the PRATIO multiplied by IFC [15]. For the proposed model was obtained a value of PRATIO = 0.813, PNFI = 0.503, and PCFI = 0.514, these values should be compared with the values of an alternative model or modified the proposed to determine which boasts greater parsimony (simple model).

The greater parsimony is present in the model with the indices higher. For the AIC criterion describes in a general way the accuracy and complexity of the model, as opposed to the three previous criteria of the adjustment of parsimony, the model that best fits are the one that has the lowest index AIC compared between two models. For the model proposed by the AIC criterion = 1174.619, as can be seen in Table X.

TABLA IX
PARSIMONY-ADJUSTED MEASURES OF THE PROPOSED MODEL [AUTORES].

Model	PRATIO	PNFI	PCFI
Default model	.813	.503	.514
Saturated model	.000	.000	.000
Independence model	1.000	.000	.000

TABLA X
AIC OF THE PROPOSED MODEL [AUTORES].

Model	AIC	BCC	BIC	CAIC
Default model	1174.619	1174.923	1361.551	1392.551
Saturated model	210.000	211.031	843.159	948.159
Independence model	2942.756	2942.893	3027.177	3041.177
Zero model	21497.000	21497.000	21497.000	21497.000

IV. DISCUSSION AND CONCLUSIONS

Because the size of the sample used is large, the data obtained from x^2 and p does not allow concluding on the model, so it is necessary to deepen the analysis with other criteria such as the RMSEA. The values of RMSEA between 0.08 and 0.1 provide a mediocre, and below 0.08 shows, a good fit [12].

With this approach, the proposed model presents a good adjustment, due to that obtained an RMSEA of 0.068. Complementing this result, the index of the goodness of fit, which is independent of the size of the sample, GFI = 0.948, which is very close to 0.95, confirming that criterion.

Incremental adjustment measures must be greater than 0.9 to reflect a good fit, according to Table III. It was obtained values of CFI = 0.632, TLI = 0.548, and NFI = 0.618, representing an average adjustment of the proposed model compared with the null.

As final criteria, the adjustment measures of parsimony, it yields information relevant when compare it with another alternative model. The values obtained are PRATIO = 0.813, PCFI = 0.514, PNFI = 0.503, which are in the range average with average adjustment.

In the case of this study concluded that there is a misalignment in the model, so they opted to use a tool that helps to improve, as are the rates of modification (M.I.) that can see in Table XI. The rate of change for a parameter is an estimate of the amount by which the role of discrepancy x^2, decreases if the analysis is repeated eliminated restrictions on that parameter [16].

TABLA XI
MODIFICATION INDICES OF THE PROPOSED MODEL [AUTORES].

			M.I.	Par Change
e13	<-->	Er2	21.479	.019
e13	<-->	Er1	11.142	-.012
e14	<-->	Er2	12.899	-.014
e14	<-->	Er1	24.270	.015
e14	<-->	e13	16.772	-.021
e12	<-->	Er3	10.577	.011
e12	<-->	Er1	10.988	-.011
e12	<-->	e13	13.355	.020
e11	<-->	Er3	14.599	.016
e11	<-->	Er2	4.162	-.009
e11	<-->	e13	54.635[a]	.046
e11	<-->	e12	5.615	-.015
e10	<-->	e13	6.615	.013
e10	<-->	e14	11.355	-.016
e10	<-->	e12	8.292	.014
e10	<-->	e11	16.495	-.024
e9	<-->	Er3	16.971	-.015
e9	<-->	Er2	6.517	.010
e9	<-->	e13	7.625	-.015
e9	<-->	e10	4.504	.010
e8	<-->	e13	16.204	-.025
e8	<-->	e14	5.394	.013
e8	<-->	e12	4.944	.013
e8	<-->	e11	7.739	.019
e7	<-->	e13	11.666	.022
e7	<-->	e12	10.611	-.020
e7	<-->	e8	30.085[b]	.037
e6	<-->	e8	16.783	.024
e6	<-->	e7	9.607	.019
e5	<-->	Er3	4.664	.009
e5	<-->	Er1	10.223	-.012
e5	<-->	e13	27.214	.032
e5	<-->	e12	7.999	-.017
e5	<-->	e8	8.509	-.019
e5	<-->	e6	20.965	-.027
e4	<-->	e13	4.253	-.012
e4	<-->	e11	5.001	-.014
e4	<-->	e10	4.870	.011
e4	<-->	e9	4.076	.011
e4	<-->	e7	22.414	-.030
e4	<-->	e6	19.253	-.024
e4	<-->	e5	20.033	.027
e3	<-->	Er2	16.169	-.017
e3	<-->	Er1	4.182	.007
e3	<-->	e13	8.663	-.017
e3	<-->	e14	21.435	.024
e3	<-->	e10	26.024	-.027
e3	<-->	e8	27.662	-.033
e3	<-->	e6	19.959	.025
e3	<-->	e4	16.169	.023
e2	<-->	Er2	5.912	-.010
e2	<-->	Er1	10.067	.011
e2	<-->	e9	10.422	-.017
e2	<-->	e8	6.762	-.015
e2	<-->	e5	5.134	-.013
e2	<-->	e4	31.049[b]	.030
e2	<-->	e3	13.190	-.020
e1	<-->	e14	6.225	-.014
e1	<-->	e8	4.954	-.014
e1	<-->	e7	6.615	-.017
e1	<-->	e6	10.278	-.018
e1	<-->	e4	59.855[b]	-.045
e1	<-->	e3	15.322	.023
e1	<-->	e2	102.417[b]	.054

[a] M.I. of different factors with significant contribution
[b] M.I. of the same factor with significant contribution

The model was modified considering the values of M.I. that more contribute to the reduction of the Chi-square and, therefore, to the proper adjustment of the same and established a new one called the "modified" model, with the relationships suggested in Table XI.

Relations were established between errors that belong to the same factor as is the case of "e1<-->e2", which are related to F1 and contribute to a reduction in the Chi-square test of 102.417. In contrast, with the relationship of "e11<-->e13", which would have a significant contribution in reducing the Chi-square test of 54.635, it would not be possible since these items belong to different constructs or factors, and do not have a theoretical to foster this relationship. The reduction in the Chi-square test was used as a criterion for the relations that correspond to the same factor, with a significant contribution greater than 30 of M.I.

The items 1 and 2 of the questionnaire in Table II, belong to the first factor, which is related, such that, if explained at the beginning of the period the syllabus, methodology, and the learning outcomes of the course, the teacher demonstrates preparation and planning for the class to teach. This also happens with the match between the items 1 and 4, with the explanation at the beginning of the period of the syllabus, methodology, and the learning outcomes of the course the teacher gives to know students the domain in the topics to be discussed in class.

In the same way with questions 2 and 4, if the teacher demonstrates the planning and preparation of the class, students perceive the domain in the topics that the teacher will teach. Taking into account the items 7 and 8, these relate to the scope of the experiences during their studies and how to contribute to the graduation profile of students by promoting the interest in the subject. All of these relationships analyzed to justify the modified model, as shown in Fig 2.

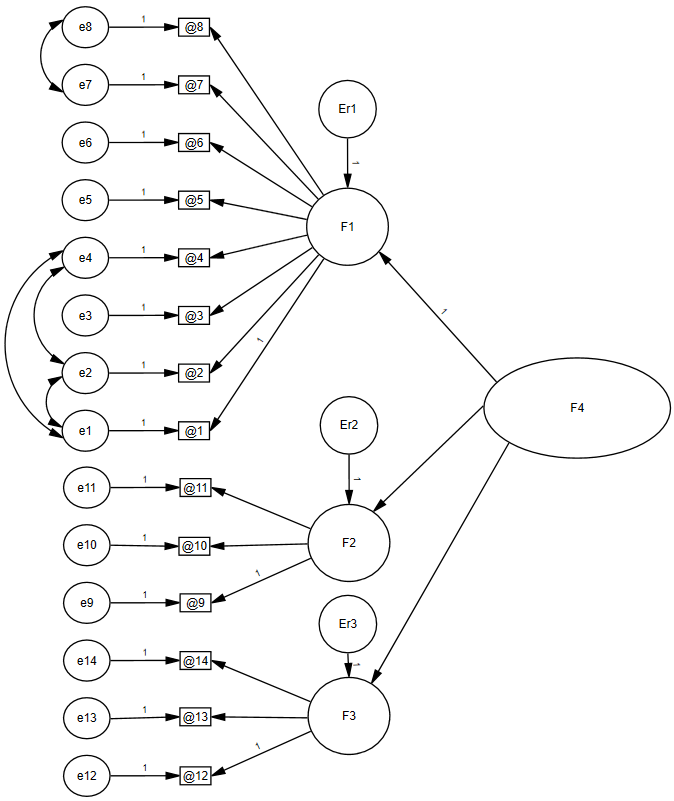

Fig. 2 Modified Model of Teacher Evaluation.

A comparative summary of the global adjustment measures for the proposed model, and the modified indicated in table XII, appreciates the improvements obtained with small modifications suggested in the previous paragraph. There was a reduction of 282.58 in the Chi-square, as well as a reduction in the RMSEA to 0.059; the rate of the goodness-of-fit GFI of 0.961 is closer to the unit. Incremental adjustment measures presented an improvement in around 0.1 in each criterion, which together with the modified model improvement about the proposed.

The adjustment measures of parsimony presented higher values to the proposed model, which is desirable after the modification, except the PRATIO, which decreases because of the degrees of freedom too. The modified model is more straightforward than the proposed model because 274,599 reduce the AIC.

TABLA XII
GLOBAL ADJUSTMENT MEASURES FOR THE PROPOSED AND MODIFIED MODELS [AUTORES].

	PARAMETERS	PROPOSED MODEL	MODIFIED MODEL
ABSOLUTE ADJUSTMENT MEASURES	Chi-square	1112.6	830.020
	p	0.000	0.000
	RMSEA	0.068	0.059
	GFI	0.948	0.961
INCREMENTAL	CFI	0.632	0.731
ADJUSTMENT MEASURES	TLI	0.548	0.650
	NFI	0.618	0.715
PARSIMONY-ADJUSTED MEASURES	PRATIO	0.813	0.769
	PCFI	0.514	0.562
	PNFI	0.503	0.550
	AIC	1174.619	900.020

The findings of the AFC promote the improvement of the model, which delivers information that encourages relationships between items and helps their simplification of the assessment instrument for the teacher, as can be seen in Table XI. Thus, the relations between items 1-2, 1-4, 2-4 and 7-8 that belong to the same factor F1, generate a more significant contribution in reducing the Chi-square, and in addition to that factor groups a higher number of items, in contrast to the factors F2 and F3.

The assessment instrument to the teacher of 14 items can be optimized by establishing relationships between the various questions and encouraging reduction in the number of items, generating improvements in the process of the comprehensive evaluation of teaching performance by improving the quality in the Higher Education System in Ecuador.

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