

## COMPLEMENTARY ANALYSIS OF THE IMPACT OF TEACHER TRAINING COURSES AT THE TECNM CAMPUS PACHUCA

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**Abstract:** The impact of teacher training in the I.E.S. It is essential to know the way in which the competences acquired by teachers are being exercised and take them to the classroom to verify that what has been learned is reflected, therefore, it is necessary to know the impact through an effective method, which consists of the teacher evaluation carried out by the student in different areas such as Didactic Instrumentation, Motivation, ICT Mastery, Professional Competences and Evaluation. With the analysis of the data from 2021 and 2022, it is sought to find improvement relationships between training periods and to know that with this the statistical analysis with different variables that allow verifying the numerical impact on participating teachers, comparison between men and women, include range of ages and have averages according to the variables used and described in the process of the present investigation, which will serve as a basis to know improvements that will be concerted through statistics that can be considered as a basis to verify the real impact of the teacher's performance in the classroom after having been trained, and if he is really generating changes in his daily work of this laudable work, to later impact the educational model, teaching-learning strategies, forms of evaluation and inclusion of ICT in the educational process and course management.

**Keywords** — Impact of Training, Teacher training, evaluation, competencies, evaluation.

## INTRODUCTION

The competitiveness of organizations demands the design of innovative and dynamic strategies that respond to the needs of their users. In the higher education field, teaching updating largely guarantees the quality of the service provided, for this reason training is essential and requires a process that is well diagnosed and correctly designed from planning based on educational trends

and needs. and later the evaluation of the impact as part of the process of continuous improvement.

This article shows a theoretical framework in which the impact of training a contextual framework that has to do with the competencies that a TecNM teacher must have is documented, ranging from course planning to evaluation.

Likewise, a description of the Method is presented, where the problem identified in the evaluation of the impact on teacher training is mentioned, the objective that is sought to be fulfilled and the selected methodology that shows the step-by-step procedure from the recovery of the data by item. to data analysis.

Finally, the conclusions and recommendations of general application for the TecNM/ITPachuca are presented, which can be applied as continuous improvement in the teacher training process and be extended to similar educational institutions.

## **THEORETICAL FRAMEWORK**

There are different evaluation methodologies that are effective for any type of company and/or institution to be able to measure the impact of personnel training. In this article, the use of the Kirkpatrick method is proposed, since due to the points that constitute it, it is adaptable to the objective sought. It is important to indicate that this study is complementary to the one carried out previously, this study includes comparisons of teacher evaluation, self-evaluation and indicates some stratifications that were not previously carried out, so that the analysis of the information is more specific and detailed in terms of regarding performance evaluation. The Kirkpatrick model has several levels of impact description, these are: response, learning, performance and results; and it is precisely in the area of performance where, according to the criteria of the students

and the department head, there is a greater number of data in this research study.

In the article (Martínez et al., 2023), in addition to the Kirkpatrick method, which was used as a training impact model, a comparison of other methods of evaluating the impact of training courses is presented, referencing the previous article, where different models with different study parameters are included; the models included in the comparison are the Werther, CIPP, CIRO, GDOR, Wade, and Phillips models; while the study parameters in general are: Context, inputs, reactions, behavior, learning, inputs, processes, product, results among others. (Morell, & González, 2018)

According to (Orozco, 2017), in Mexico, the term labor competencies began to be applied in the mid-1990s. Promoted by the Federal Government, through the CONOCER - Council for Standardization and Certification of Labor Competence, the body in charge of establishing a certification system for the labor capacity or “competence” of workers, in order to promote their development based on performance quality standards; This competency system must also serve to guide education and training towards the needs of the productive and labor markets (Matilde, E., Rodríguez, R., Elmina, D., & Rivadeneira Rodríguez, M, 2022).

The evaluation component is made up of some evaluation instruments used in non-formal teaching-learning processes. The evaluation instruments are information recording formats that have their own characteristics. They serve to collect the information that is required based on the characteristics of the learning that is intended to be evaluated and the conditions in which it will be applied.

Impact evaluation is a method that combines quantitative and qualitative analysis that makes it possible to determine more

broadly whether the project has or could have the expected effects on (individuals, groups of individuals, or institutions). (Leyva-Reyes, Nayvis, & Hidalgo-Parra, 2020) and (Yohana, & Hernández-Hechavarría, Yusleidis, 2020)

## DESCRIPTION OF THE PROBLEM

This research is aimed at solving the problem of the impact of professional teacher and professional training at TecNM / IT Pachuca (Campus Pachuca) with specific data from the years 2021 and 2022. The problem lies in the fact that even when teachers capacitan, a methodology has not been fully implemented that allows for precise knowledge of how teacher and professional training courses are used by teachers and the skills acquired are put into practice with students.

## GENERAL OBJECTIVE

To measure the impact of professional and teacher training in the refresher courses that ITPachuca teachers take, in order to know more exactly what their application is in their teaching and learning processes of the acquired skills.

## METHODOLOGY USED

The method of analysis is the evaluation of the impact of training courses based on Kirkpatrick, this method is the one that has been used since the beginning of the investigation and as mentioned, a segmentation of specific items was carried out to know the evaluation of teacher performance in the following areas Didactic Instrumentation, Motivation, Mastery of ICT, Professional Competences and Evaluation.

It is important to indicate that the points of the methodology that were considered with the data obtained within the marked period were:

a) Reaction (Service survey answered by teachers). With a Likert scale, it is

measured from 1 to 5 aspects of the service rated by teachers in relation to three areas; Instructor, material and course.

b) Knowledge (Use of teachers, qualifications or results of teachers). Report of grade lists, by course, by intersemester, the minimum grade is 70/100, NA is Not Accredited.

c) Institutional evaluation (Teacher and departmental). In this case, the Teacher Evaluation is a questionnaire of 48 questions on a Likert scale that have to do with Mastery of the subject, Course planning, Learning environments, Strategies, methods and means, Motivation, Evaluation, Communication, Course management and the Overall satisfaction. Regarding the Departmental Evaluation, the teacher is evaluated with 80% of the weight of the evaluation by the head of the academic department and 20% in self-evaluation on the aspects of competence of the TecNM that are: Teaching, Management, Linking, Tutoring and Research.

d) Correlation between the Teacher Performance Index obtained from their Training Course and Student Satisfaction in relation to the course taken by the teacher.

Initially we must indicate that the correlation coefficient describes the strength of the relationship between two sets of variables and can take any value between -1 and +1 inclusive, so that the following cases can be determined for the results to be obtained:

- If the result is 0, it means that there is no relationship between the two variables (teacher performance index and student satisfaction).
- A value close to 0 indicates that there is little association between the variables.

- A result equal to 1 implies that there is a perfect relationship between the variables since they go in the same direction. For example, in our analysis a correlation of 1 means that a level of

High teacher performance goes hand in hand with high student approval ratings.

- A result equal to -1 indicates a perfect relationship between the variables, but in the opposite direction, that is,

that the higher the level of performance of teachers, the lower the level of approval.

- A value equal to 0.5 shows us that the relationship between the variables is moderate. From 0 to 0.5 we will say that the relationship is weak and from 0.5 to 1 we will say that the relationship is strong, whether positive or negative for both cases.

**Spearman's model.** It is a correlation model that measures the relationship between two continuous random variables, it is a linear association model, which uses ranges and the order number of the population to compare the ranges, that is, it orders the values on an ordinal scale.(Douglas, 2012).

**Pearson's model.** Statistical model that analyzes the linear relationship between two variables, being independent of the scale of measurement of the variables. These variables must be measured independently to eliminate bias in the results (Douglas, 2012).

The model selected for this study is Pearson's due to the characteristics of the model mentioned above. Pearson's correlation coefficient focuses on determining the degree of relationship or association between variables. (Douglas, 2012), states that the formula for calculating the correlation coefficient is presented below:

## INTERPRETATION OF THE CORRELATION COEFFICIENT

The correlation of variables can vary between +1 and -1, with a large scale of interpretations, according to the author (Salvador, 2010), the appreciation of the result of correlation of variables depends on the statistical significance, direction or meaning of the correlation, the nature and variability of the data set under study.

The competitiveness of organizations demands the design of innovative and dynamic strategies that respond to the needs of their users. In the higher education field, teaching updating to a large extent guarantees the quality of the service provided, for this reason training is essential and requires a correctly designed process from planning based on educational trends and needs and subsequently the evaluation of the impact as part of the continuous improvement process.

## PROCEDURE

The proposed procedure has the following phases:

- a) Data recovery
- b) Clustering of data files
- c) Formatting and file processing
- d) Generation of reports

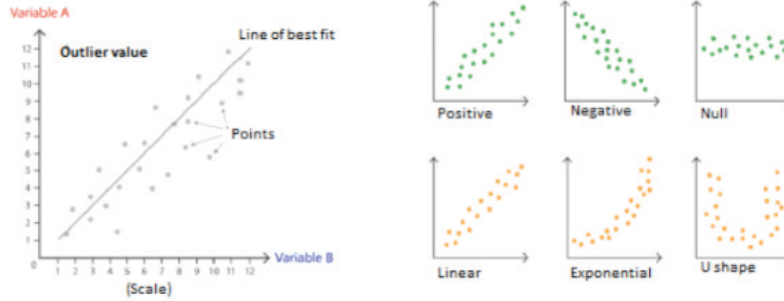
Information analysis Each step is described below:

- a) Data recovery:

The data is normally found in Excel tables, information from the 2021 and 2022 inter-semester teacher training periods has been considered, in terms of reaction and knowledge items, that is, service surveys and lists of qualifications, for performance it is counted with the Institutional Evaluation process, and both processes have been systematized, the teacher evaluation carried out by the

$$r_{XY} = \frac{n \sum XY - \sum X \sum Y}{\sqrt{[n \sum X^2 - (\sum X)^2][n \sum Y^2 - (\sum Y)^2]}}$$

### Scatter Plot Anatomy



Source: [https://datavizcatalogue.com/ES/metodos/diagrama\\_de\\_dispersion.html](https://datavizcatalogue.com/ES/metodos/diagrama_de_dispersion.html)

students and the departmental evaluation process, which is a centralized evaluation system of the TecNM. The recovery of the data is from the original source of information, folders, memory storage disks, among others, where the data is located.

b) Grouping of data

Because the data is obtained from different sources, formats (pdf, for example), and even times and dates, it is necessary to group for purposes, this becomes a core point for the next step

c) Formatting and data processing

In the processes of Extraction, Transformation and Loading of data (ETL), a methodology used in data mining and analysis of large amounts of information (Big Data), it must begin by transforming the data in such a way that they have a structure similar to that of data. less per item, place or attach fields that help the analysis and find connections with the other items to be able to load the data properly, in such a way that they can be loaded into an application that can exploit the data and generate reports with the Least effort. This process of transformation or formatting and data processing are shown in figures 1 and 2.

d) Generation of reports; With the help of Excel Pivot Tables and Power BI (both MS Microsoft solutions) we seek to obtain reports that allow us to know the parameters of each item, obtaining data relationships to generate summary tables on different variables such as:

1. General information card by course and institutional: With averages for each of the items, that is, reactions, grades, average control group responses (if they have one) and institutional evaluations. It is important to comment

that this is a report by course and the averages are general. That is, of all participating teachers.

2. Certificate per teacher courses taken: This certificate shows the number of courses taken, the average grade obtained in each course (an NA is averaged as Zero), its average that indicates the satisfaction of each course, the average of its groups of control (if any) and the average of its institutional evaluation.

1. Certificate per teacher by course and institutional: This certificate shows the name of the course taken, the grade obtained (an NA is averaged as Zero), its average that indicates satisfaction with the course, the average of its control group (of have it) and the average of its institutional evaluation.

2. Comparison of the impact of training courses by age ranges.

Dispersion diagram; It seeks to identify the possible correlation between, if by obtaining a teacher evaluation result made by the student, the Teacher will seek to improve his qualification for the following semester

According to figures 4 and 5, we can conclude that it is verified that indeed **yes exists a Strong Positive Correlation** because the majority of Teachers will seek to improve their Academic performance, based on their results evaluated by their students, however, a minority of Teachers with Advanced Age, 75 years and older, are not complying with this part, thus stagnating Its performance.

## COMPARISON OF TEACHER TRAINING BY GENDER.

Control diagram:

According to Figure 6, with the results obtained we can determine what; Are the **Women Teachers who Get Better Results**

| A              | B  | C                                   | D                           | E             | F                                  | G             | H |
|----------------|--|-------------------------------------|-----------------------------|---------------|------------------------------------|---------------|---|
| INTERSEMIESTER | COURSE   | INSTRUCTOR                          | DEPARTMENT                  | RFC           | TEACHER                            | QUALIFICATION |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. ERIC LEÓN OLIVARES             | AFTER-CURRICULAR ACTIVITIES | HEAR700427H45 | JOSÉ RIGOBERTO HERNÁNDEZ ALBURQUER | 93            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | MTE. KARLA MARTÍNEZ TAPIA           | AFTER-CURRICULAR ACTIVITIES | ZUMD601229A2A | DAVID EDGAR ZUÑIGA MEJÍA           | 47            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. VÍCTOR MANUEL PINEDO FERNÁNDEZ | INFORMATION CENTER          | CAJA910201K33 | ARMANDO CABRERA JIMENEZ            | 14            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. VÍCTOR MANUEL PINEDO FERNÁNDEZ | INFORMATION CENTER          |               |                                    | 85            |   |
| JUN - AGO 2020 | COMMUNICATION WITH DIGITAL MEDIA AND PRODUCTION OF MULTIMEDIA RESOURCES              | DR. ARTURO GONZÁLEZ CERÓN           | CENTRO DE INFORMACION       | CAJA910201K33 | ARMANDO CABRERA JIMENEZ            | 96            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. ERIC LEÓN OLIVARES             | BASIC SCIENCES              | AADA750807AE7 | ADRIANA ALVAREZ DURAN              | 0             |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. CLEMENTE LUNA RAMOS            | BASIC SCIENCES              |               | APOLINAR GALVÁN VILLANUEVA         | 100           |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. VÍCTOR MANUEL PINEDO FERNÁNDEZ | BASIC SCIENCES              |               | ARMANDO CAMACHO CASTILLO           | 98            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. ERIC LEÓN OLIVARES             | BASIC SCIENCES              | PERL731213G71 | LUIS PÉREZ REYES                   | 88            |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. CLEMENTE LUNA RAMOS            | BASIC SCIENCES              |               | MARIA EMMA CHAVEZ RAMIREZ          | 100           |   |
| JUN - AGO 2020 | BASIC MOODLE ONLINE COURSE FOR TEACHERS  | ING. CLEMENTE LUNA RAMOS            | BASIC SCIENCES              |               | MARIO MARTINEZ MARTINEZ            | 90            |   |
| JUN - AGO 2020 | WORKSHOP FOR THE STANDARDIZED FILLING OF TEACHING INSTRUMENTATION ITPAC-AC-PO-004-08 | MCC. SALVADOR MARÍNEZ PAGOLA        | CIENCIAS BASICAS            | AADA750807AE7 | ADRIANA ALVAREZ DURAN              |               |   |

Figure 1. Data transformation for the reaction item

| DEPARTMENTAL EVALUATION JANUARY-JUNE 2021 |                             |                |                                   |             |     |      |     |   |                      |        |
|---|-----------------------------|----------------|-----------------------------------|-------------|-----|------|-----|---|----------------------|--------|
| Semester                                  | Teacher's name              | Department     | Evaluation type                   | A (DOCENCI) | B   | C    | D   | E | OVERALL DEPARTMENTAL | PROM   |
| JAN-JUNE 2021                             | ACOSTA GARCIA JAVIER        | EARTH SCIENCES | SELF-ASSESSMENT                   | 5           | 5   |      |     |   | 4.533333333          | 5      |
| JAN-JUNE 2021                             | ACOSTA GARCIA JAVIER        | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 3.75        | 4.5 |      |     |   | 0                    | 4.4166 |
| JAN-JUNE 2021                             | ALONSO ALVAREZ LUIS         | EARTH SCIENCES | SELF-ASSESSMENT                   | 3           | 3.5 |      |     |   | 4.166666667          | 3.8333 |
| JAN-JUNE 2021                             | ALONSO ALVAREZ LUIS         | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 3.25        | 3.5 |      |     |   | 0                    | 4.2    |
| JAN-JUNE 2021                             | AREU RANGEL OMAR SALVADOR   | EARTH SCIENCES | SELF-ASSESSMENT                   | 5           |     |      |     |   | 5                    | 5      |
| JAN-JUNE 2021                             | AREU RANGEL OMAR SALVADOR   | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 4.75        |     |      |     |   | 0                    | 5      |
| JAN-JUNE 2021                             | ASSAD SANCHEZ HELENA        | EARTH SCIENCES | SELF-ASSESSMENT                   | 4.4         |     |      |     |   | 2.14                 | 4      |
| JAN-JUNE 2021                             | ASSAD SANCHEZ HELENA        | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 1           |     |      |     |   | 2                    | 1      |
| JAN-JUNE 2021                             | AVILA MORALES ALVARO        | EARTH SCIENCES | SELF-ASSESSMENT                   | 3           | 2.5 |      |     |   | 2.166666667          | 2.8333 |
| JAN-JUNE 2021                             | AVILA MORALES ALVARO        | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | .75         | .5  |      |     |   | 2                    | 2      |
| JAN-JUNE 2021                             | BALTAZAR SALAZAR JORGE      | EARTH SCIENCES | SELF-ASSESSMENT                   | 2           | 3   | .67  | 2   | 3 | 2.724                | 2      |
| JAN-JUNE 2021                             | BALTAZAR SALAZAR JORGE      | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 4.4         | 4   | 0    | 0.5 | 5 | 0                    | 2.7    |
| JAN-JUNE 2021                             | CARRASCO BARDALES JOSE LUIS | EARTH SCIENCES | SELF-ASSESSMENT                   | 1.75        | 0   |      |     |   | 3.4                  | 1      |
| JAN-JUNE 2021                             | CARRASCO BARDALES JOSE LUIS | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 2.75        | 3   |      |     |   | 5                    | 4      |
| JAN-JUNE 2021                             | CASTILLO ESPINOSA HURIEL    | EARTH SCIENCES | SELF-ASSESSMENT                   | 4           | 3   | 1.67 | 1   | 5 | 2.516666667          | 3.2    |
| JAN-JUNE 2021                             | CASTILLO ESPINOSA HURIEL    | EARTH SCIENCES | DEPARTMENTAL TEACHING PERFORMANCE | 3.25        | 4   | .33  | 0   | 3 | 0                    | 2.3333 |
| JAN-JUNE 2021                             | CASTILLO MORA ERIKA MARIA   | EARTH SCIENCES | SELF-ASSESSMENT                   | 4.5         | 5   | 0    | 2   | 5 | 2.36                 | 3      |

Figure 2. Data transformation for the knowledge category (Grade lists by course)

| INSTRUMENT OF EVALUATION JANUARY 2021-JUNE 2022 |                                |   |  |   |   |   |  |   |  |
|---|--------------------------------|---|--|---|---|---|--|---|--|
| INSTRUMENTACIÓN DIDACTICA AGOS                  |                                |   |  |   |   |   |  |   |  |
| DEPARTMENT                                      | TEACHER                        | TEACHER EVALUATION AVERAGE (Average of all) | EVALUATION FOR TEACHING (Planning, Strategies, methods, motivation, communication and course management) | DEPARTMENTAL EVALUATION (Complete, Department and Autoev) | AVERAGE EVALUATION FOR TEACHING + DEPARTMENTAL EVALUATION | TEACHER EVALUATION AVERAGE (Average of all) | EVALUATION FOR TEACHING (Planning, Strategies, methods, motivation, communication and course management) | DEPARTMENTAL EVALUATION (Complete, Department and Autoev) |  |
| C. OF THE EARTH                                 | OCADIZ BARRON FERNANDO GABRIEL | 4.463                                       | 4.252  | #N/A  | #N/A  | 4.463                                       | 4.604  | 1.575   |  |
| C. OF THE EARTH                                 | ACOSTA GARCIA JAVIER           | 4.601                                       | 4.452  | 4.533333333   | 4.492666667   | 4.601                                       | 4.458  | 4.5   |  |
| C. OF THE EARTH                                 | ALVAREZ LUIS ALONSO            | 4.296                                       | 3.964  | #N/A  | #N/A  | 4.296                                       | 4.074  | #N/A  |  |
| C. OF THE EARTH                                 | ARAGON GARNICA VERONICA        | 4.476                                       | 4.218  | #N/A  | #N/A  | 4.476                                       | 4.178  | 2.366666667   |  |
| C. OF THE EARTH                                 | AREU RANGEL OMAR SALVADOR      | 4.442                                       | 4.576  | 5   | 4.788   | 4.442                                       | 4.462  | 4.916666667   |  |
| C. OF THE EARTH                                 | ARREOLA BAUTISTA MAGNO LEONEL  | 4.415                                       | 4.28   | #N/A  | #N/A  | 4.415                                       | 4.256  | 2.453333333   |  |
| C. OF THE EARTH                                 | ASSAD SANCHEZ HELENA           | 4.361                                       | 3.99   | 2.14  | 3.065   | 4.361                                       | 4.012  | 2.05  |  |
| C. OF THE EARTH                                 | AVILA MORALES ALVARO           | 4.346                                       | 3.664  | 2.166666667   | 2.915333333   | #N/A  | #N/A   | #N/A  |  |

Figure 3. Average institutional and departmental evaluation



| TEACHERS BY AGE RANGES | AVG GRADES FOR THE YEAR | EXPECTED GOAL | LSC         | LIC         |
|------------------------|-------------------------|---------------|-------------|-------------|
| GROUP 25-35 YEARS      | 4.3514                  | 5             | 4.415844005 | 3.928402727 |
| GROUP 35-45 YEARS      | <b>4.383642857</b>      | 5             | 4.415844005 | 3.928402727 |
| GROUP 45-55 YEARS      | 4.347608889             | 5             | 4.415844005 | 3.928402727 |
| GROUP 55-65 YEARS      | 4.084234286             | 5             | 4.415844005 | 3.928402727 |
| GROUP 65-75 YEARS      | 4.1161875               | 5             | 4.415844005 | 3.928402727 |
| GROUP 75-85 YEARS      | 3.749666667             | 5             | 4.415844005 | 3.928402727 |

|                           |                    |
|---------------------------|--------------------|
| <b>AVERAGE</b>            | <b>4.172123366</b> |
| <b>STANDARD DEVIATION</b> | <b>0.243720639</b> |
| <b>UPPER LIMIT</b>        | <b>4.415844005</b> |
| <b>LOWER LIMIT</b>        | <b>3.928402727</b> |

Table 1. Control Diagram by Age.

PERFORMANCE IN TEACHER EVALUATION FROM JANUARY 2021- JANUARY 2022 CARRIED OUT BY I.T.P STUDENTS

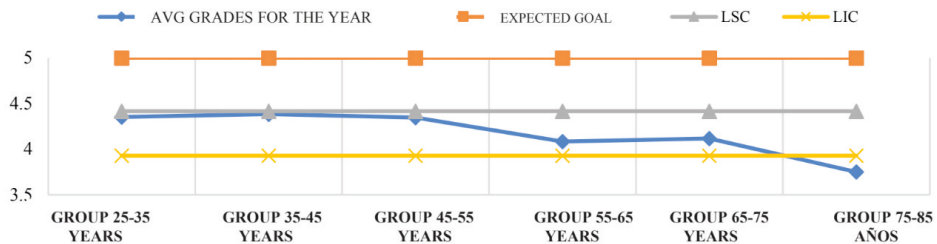


Figure 4. Control Diagram by Age Ranges

EXISTING RELATIONSHIP BETWEEN AVERAGES EVALUATED BY STUDENTS TO THEIR TEACHERS PER SEMESTER

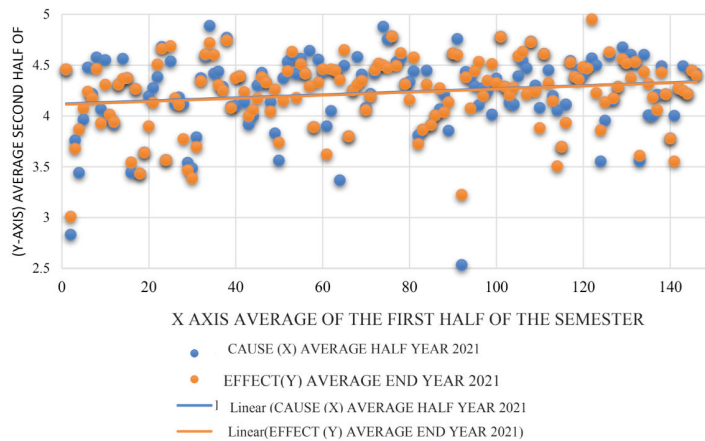


Figure 5. Dispersion diagram

|   | CONCLUSIONS             | ANSWERS                            |
|---|-------------------------|------------------------------------|
| 1 | CORRELATION COEFFICIENT | <b>0.72892138</b>                  |
| 2 | LEVEL OF CORRELATION    | <b>STRONG POSITIVE CORRELATION</b> |
| 3 | RELATIONSHIP TYPE       | <b>WEAK POSITIVE RELATIONSHIP</b>  |

Table 2. Conclusions and response from the analysis.

| NUMBER OF TEACHERS | TEACHERS BY GENDER | AVG GRADES FOR JANUARY 2021- JANUARY 2022 | EXPECTED GOAL SCORE | LSC         | LIC        |
|--------------------|--------------------|---|---------------------|-------------|------------|
| 49                 | WOMEN              | 4.26                                      | 5                   | 4.415844005 | 3.92840273 |
| 49                 | MEN                | 4.191420408                               | 5                   | 4.415844005 | 3.92840273 |

Table 3. Comparison of teachers by gender

RESULTS CONTROL CHART BY GENDER JANUARY 2021 JANUARY 2022

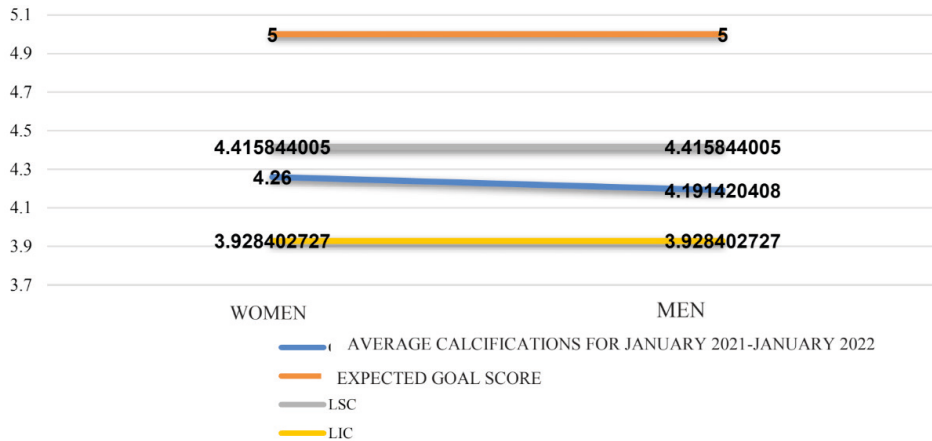


Figure 6. Control diagram



Figure 7. Behavior of grades obtained by professors in evaluation by students and departments from August 2021 to June 2022

evaluation in the period January 2021-January 2022, obtaining an average of **4.26** on a 5-point evaluation scale, this brings them closer to the Central Control Limit, which is very acceptable in terms of Quality. On the other hand, the **Teachers Men** they obtain a 4.19 average which is also quite acceptable in the aforementioned period.

d) Analysis of information; In this sense, the analysis of the information is obtained from the reports generated and is oriented to know particularly some aspects that will allow better decisions to be made in the diagnosis, programming, management, monitoring and evaluation of the courses taught, considering aspects such as the following:

1. Use of courses by teachers by department and institutionally.
2. Number of courses and rating of the service by teachers.
3. Relationship between courses taught, skills acquired and putting them into practice in the classroom or virtual strategies
4. List of courses taken by teachers with respect to their teaching and departmental evaluation.
5. Efficiency in the diagnosis of courses carried out by the academic areas.

In Figure 7, you can see the behavior graphs of teacher qualifications according to their evaluation obtained by teachers and department heads based on the different items of analysis.

These are some aspects of analysis, which possibly at the beginning will allow us to mark a more productive path in measuring the impact of teacher and professional training courses.

## CONCLUSIONS AND RECOMMENDATIONS

The final conclusions and recommendations for a constant improvement of the process are presented below:

### CONCLUSIONS

It is a fact that the impact of training courses in an educational institution is quite a challenge, since the final idea is that it helps students receive higher quality educational instruction, but this is often not the same. Since within the process there are original failures that have to do with the proper identification of training needs, since they are not aligned with the curricular needs, another situation is that teachers are only trained to fulfill a requirement, so they do not apply what they can acquire in skills and finally, the fact of not having a systematized mechanism that allows measuring the real impact of the courses and their application.

Therefore, having at least one evaluation process, variables and more defined measurement relationships, it will be possible to gradually generate a path and a procedural culture that allows improving training courses, training needs, but, above all, that apply with those who must be benefited, the students.

### RECOMMENDATIONS

After having carried out this study, the following recommendations are suggested to improve the training process at TecNM/IT Pachuca, which are:

- Systematize the process, that is, avoid as much as possible manual processes through a system that allows online control of the training process.
- Comprehensive and consistent data management and outline systematized support.
- As the process consolidates, search

through other already referenced methodologies, measure other elements of impact.

- Promote the participation of management levels, heads of academic departments and academies, in such a way that the diagnoses of needs are consistent with the curricular progress of the students and the graduation profile of the careers.
- Motivate the participation of teachers and the application of the acquired skills.
- Motivate so that, with the results obtained, teachers are trained and at the same time improve in their respective evaluations or maintain their high performance level.
- Take advantage of statistical results

to direct training according to specific needs, promote participation in departments with low rate of course attendance and improve teacher and departmental evaluation rates.

- Train in new educational models and teaching strategies that allow students to approach where forms of learning and social generations are integrated, around an increasingly active and changing knowledge society.
- Promote that this type of study or research be carried out in different scenarios, institutions or even educational systems, in order to carry out more specific diagnoses of teacher training and its real impact on the education and training of students.

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