

Implementation of a Quantitative Method to determine the Degree of Satisfaction of the Physics Laboratory Service within the Faculty of Electrical Mechanical Engineering of the Veracruzana University in the Poza Rica - Tuxpan Region

Implementación de un Método Cuantitativo para determinar el Grado de Satisfacción del Servicio del Laboratorio de Física dentro de la Facultad de Ingeniería Mecánica Eléctrica de la Universidad Veracruzana en la Región Poza Rica - Tuxpan

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Abstract

It is important to mention that educational quality and excellence within any Higher Education Institution lies in the importance of implementing continuous improvement in each of its different departments or areas, that is why constant analysis and self-evaluations of the services provided offered within it take on more and more importance, these are carried out in order to locate areas of opportunity in which it is necessary to implement strategies that help to achieve the desired levels of quality. This research is an analysis study focused on the services provided by the Physics Laboratory to its users of the Faculty of Electrical Mechanical Engineering of the Universidad Veracruzana in Poza Rica Veracruz, Mexico, using an applied opinion survey. to a sample of 169 people, which allows identifying the indices of each of the services that are provided, the results obtained provide relevant data that will later be used for the design of an improvement plan that allows generating actions that favor the continuation being a quality educational institution.

Quality, Education, Continuous improvement.

Resumen

Es importante mencionar que la calidad y excelencia educativa dentro de cualquier Institución de Educación Superior radica en la importancia de implementar la mejora continua en cada uno de sus diferentes departamentos o áreas, es por eso, que los análisis y autoevaluaciones constantes de los servicios que se brindan dentro de ella toman cada vez más importancia, estos se llevan a cabo con el fin de localizar áreas de oportunidad en las cuales se necesite implementar estrategias que coadyuven a conseguir los niveles de calidad deseados. La presente investigación, es un estudio de análisis enfocado a los servicios que presta el Laboratorio de Física a sus usuarios de la Facultad de Ingeniería Mecánica Eléctrica de la Universidad Veracruzana en Poza Rica Veracruz, México, utilizando para ello una encuesta de opinión aplicada a una muestra de 169 personas, la cual permite identificar los índices de cada uno de los servicios que en él se prestan, los resultados obtenidos aportan datos relevantes que posteriormente servirán para el diseño de un plan de mejora que permita generar acciones que favorezcan a continuar siendo una institución educativa de calidad.

Calidad, Educación, Mejora continua.

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General Objective

Implement a Quantitative Method that generates new knowledge about the degree of satisfaction of the service provided by the Physics Laboratory within the Faculty of Electrical Mechanical Engineering of the Universidad Veracruzana in the Poza Rica - Tuxpan Region, through the application of a survey or questionnaire.

Particular Objectives

- Interpret the data obtained on the degree of satisfaction of the teams within the physics laboratory.
- Analyze the qualification given to the Physics Laboratory for the services provided in it.
- Identify areas of opportunity from the conclusion of results.

What is the importance of knowing the degree of satisfaction of the service in the Physics Laboratory?

Talking about the Physics Laboratory is to mention the basic needs for any Educational Program, this given the importance for each of the users who develop different academic practices within it, that is why the research carried out seeks to know the impact generated by the degree of satisfaction in each of the areas analyzed, all this in order to continuously improve as an Academic Institution, since the Faculty of Electrical Mechanical Engineering of the Veracruzana University in the Poza Rica-Tuxpan region is a recognized and accredited academic entity in each of its educational programs for its academic quality before the AC Engineering Teaching Accreditation Council in Mexico. In the same way, it is important to know the areas of opportunity in which improvements can be implemented based on a previous investigation, which is carried out on a sample of a certain number of users that support the data of each of the results obtained.

Background

Within the research works, it is important to mention if any exploration was previously carried out or carried out in the area or department where the current research is being carried out.

In particular, the Faculty of Electrical Mechanical Engineering of the Poza Rica - Tuxpan Region, is characterized by being an Institution of Higher Education (IES) in which a large amount of work, research and prototypes of an endless application of knowledge are developed, But not only the engineering part is the one that is worked on, one of the fundamental aspects in the correct functioning of the Faculty lies in the importance of Management, that is why this type of work helps to achieve the goals set internally.

As antecedents within the analysis of degree of satisfaction in the Faculty of Electrical Mechanical Engineering, we can consider the following publications:

- "Analysis of the Service of the Computing Laboratory of the Faculty of Mechanical and Electrical Engineering at the Universidad Veracruzana in Poza Rica Veracruz, Mexico" which was published in the "Higher Education Magazine, December 2020, Vol.4, No.12, 12-19.
- Analysis of the mechanical and electrical laboratory service at the faculty of electrical mechanical engineering of the Universidad Veracruzana in Poza Rica Veracruz, Mexico, indexed in Journal University Management June 2021, Vol. 5 No.13 6-13.

Methodology

The research carried out starts from the implementation of a quantitative method, in this case a survey or questionnaire, which consists of a set of questions regarding one or more variables to be measured (Chasteauneuf, 2009), on the other hand it can be mentioned that it is based on the selection of a probabilistic sample, since these have many advantages; Perhaps the main one is that the size of the error in our predictions can be measured (Sampieri Hernández, 2014, p. 177), we can propose the application of the survey from the identification of the segment to be evaluated, later it was possible to determine the procedure to follow In this case, having a finite population it was easier to dictate or establish the steps to follow.

To determine the sample size, it was necessary to implement the following formula:

$$n = \frac{k^2 N p q}{[e^2(N-1)] + [k^2 p q]} \quad (1)$$

Where:

k: Confidence Level.

N: Population.

p: Probability of an event occurring.

q: Probability that an event will not occur.

e: Maximum accepted estimation error.

It is important to detail the analysis procedure step by step since every process has an order, then Figure 1 describes each of the stages carried out.

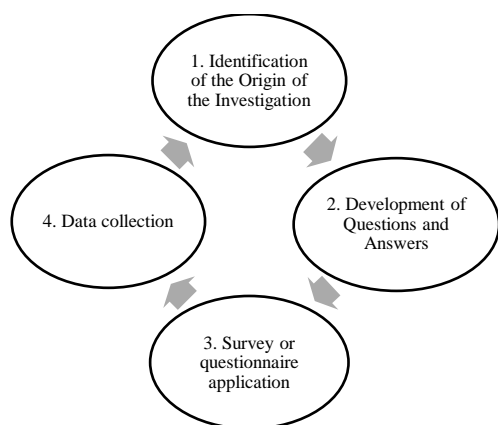


Figure 1 Phases of research development

Source: Own Elaboration

Identification of the Origin of the Investigation

Establishing the purpose of an investigation and identifying each of the variables that may exist within the aspects to be evaluated is one of the priority points for any investigation.

Derived from the aforementioned, this work arises from the need to generate a new knowledge of the current state of the degree of user satisfaction, through an analysis that provides data that allows identifying the aspects in which it can be improved in terms of service provided by the Physics Laboratory of the Faculty of Electrical Mechanical Engineering, likewise, locate each area of opportunity that is available and in which later improvement designs based on strategies are generated, all this in order to continuously improve as an institution .

Development of Questions and Answers.

The establishment and formulation of questions arises from an analysis based on each of the services that can be evaluated through a degree of satisfaction and with which the Physics Laboratory of the Academic Entity has, Figure 2 breaks down each of the services that were taken into account for your evaluation.

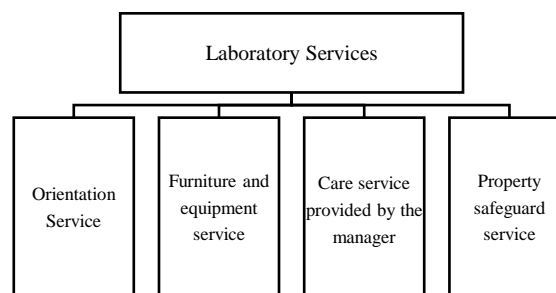


Figure 2 Physics Laboratory Services

Source: Own Elaboration


Once the measurable services were identified through a degree of satisfaction, it was decided to include complements that could strengthen the present analysis, taking important points such as the evaluation of the application of the internal regulations of the Laboratory, this due to the fact that a correct application of the rules and regulations of a certain space encourages a good service of this

Subsequently, each of the questions that make up this survey was carried out.

The answers that were taken into account for each question are based on their own, standardized and homogenized criteria, where the Excellent answer is considered the most favorable and the Bad answer is considered the least favorable.

Once the questions and answers of our questionnaire were established, the process continued to continue. Figure 3 shows the order of the questions, the possible answers and the structure presented by the survey.

It is important to mention that the implementation of the survey or questionnaire has the purpose of collecting concrete, accurate data and in the case of question 6 criteria that promote improvements or are of great importance to generate improvement or acquisition strategies in the areas, equipment and furniture within the Physics Laboratory.



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“working with quality to achieve excellence”

SURVEY OF OPINION OF DEGREE OF SATISFACTION OF THE SERVICES OF THE PHYSICS LABORATORY

With the aim of improving the level of quality and thanking you for your collaboration, the Faculty of Electrical Mechanical Engineering wishes to know your degree of satisfaction with the service provided by the Physics Laboratory of this Faculty, for the following we invite you to answer the questions next questions:

1. What is your opinion regarding the orientation service when entering the Physics Laboratory?
A) Excellent B) Good C) Regular D) Bad
2. How do you consider the furniture and equipment of the Physics Laboratory?
A) Excellent B) Good C) Regular D) Bad
3. How do you consider the care provided by the person in charge of the Physics Laboratory?
A) Excellent B) Good C) Regular D) Bad
4. How do you consider the service of safeguarding your belongings during your stay at the Physics Laboratory?
A) Excellent B) Good C) Regular D) Bad
5. How do you consider the application of the regulations of the Physics Laboratory?
A) Excellent B) Good C) Regular D) Bad
6. According to your personal criteria and for academic purposes, would you like to make any comments, suggestions or observations about the Physics Laboratory?
7. On a scale of 1 to 10, with 10 being the highest rating and 1 being the lowest. How do you rate your level of satisfaction with the Physics Laboratory of the Faculty of Electrical Mechanical Engineering?

1	2	3	4	5	6	7	8	9	10
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Thanks for your participation!

Figure 3 Satisfaction degree survey
Source: Own Elaboration

Survey or questionnaire application

For the application of the survey it was necessary to identify the total size of Population N, which was 593 students belonging to the different Educational Programs offered in this Academic Entity, however, it is important to mention that 145 of these belong to the Enrollment S19 and 147 to Enrollment S20, which have not been able to carry out activities related to this laboratory, all this due to the current health situation, therefore 292 students were discarded for the present research work, our final population being N = 301 students.

Subsequently, it was ruled that the Confidence Level would be: $k = 95\%$ (1.96), $p = 50\%$ (Because it is unknown), $q = 50\%$ (Because it is unknown) and $e = 5\%$, in such a way that, when inserting the data to the formula raised at the beginning, it is as follows:

$$n = \frac{(1.96)^2(301)(.5)(.5)}{[(.05)^2(301-1)]+[(1.96)^2(.5)(.5)]} \tag{2}$$

$$n = \frac{289.08}{[0.75]+[0.96]} \tag{3}$$

$$n = 169.05 \tag{4}$$

The final sample size was 169 users assigned to the Faculty of Electrical Mechanical Engineering. It is important to mention that the procedure for the application of the survey was carried out at the time of completing the registration within the Microsoft Forms platform, after that it was shared in different study groups, which allowed it to be answered remotely It should be noted that participation in this research was voluntary.

Data collection

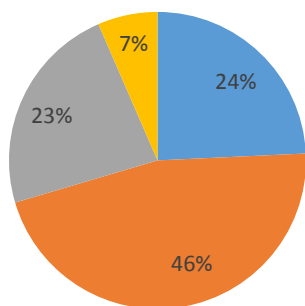
In this phase, the opinion results of the surveys were quantitatively analyzed, the results of each question yield relevant information about the objective set out with this analysis, then the results of the frequency indices are shown in each item of each one. of the questions.

Question 1 assesses the service received upon admission to the Laboratory.

1. What is your opinion regarding the orientation service when entering the Physics Laboratory?		
Answers	Opinions	Percentage
Excellent	41	24%
Good	78	46%
Regular	39	23%
Bad	11	7%
Total	169	100%

Table 1 Values recorded in question 1
Source: Own Elaboration

1. What is your opinion regarding the orientation service when entering the Physics Laboratory?



■ Excellent ■ Good ■ Regular ■ Bad

Resultados → Excellent: 41 people, Good: 78 people, Regular: 39 people, Bad: 11 people

Graphic 1 Results of question 1

Source: Own Elaboration

Interpretation of the data obtained in question 1:

It is determined that the orientation service at the time of entering the Physics Laboratory is "Good". Question 2 of the survey refers to the state of the furniture and equipment found within the Physics Laboratory.

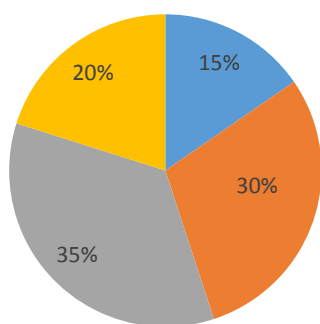
2. How do you consider the furniture and equipment of the Physics Laboratory?

Answers	Opinions	Percentage
Excellent	26	15%
Good	50	30%
Regular	59	35%
Bad	34	20%
Total	169	100%

Table 2 Values recorded in question 2

Source: Own Elaboration

2. How do you consider the furniture and equipment of the Physics Laboratory?



■ Excellent ■ Good ■ Regular ■ Bad

Resultados → Excellent: 26 people, Good: 50 people, Regular: 59 people, Mala: 34 people.

Graphic 2 Results of question 2

Source: Own Elaboration

Interpretation of the data obtained in question 2:

The equipment and furniture of the Physics Laboratory is determined to be "Regular".

Question 3 shows a more personalized approach when evaluating the care provided by the person in charge of the Physics Laboratory.

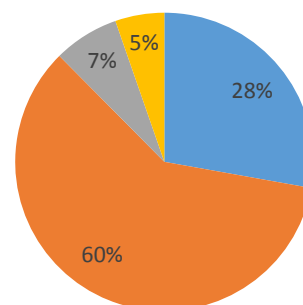
3. How do you consider the care provided by the person in charge of the Physics Laboratory?

Answers	Opinions	Percentage
Excellent	47	28%
Good	101	60%
Regular	12	7%
Bad	9	5%
Total	169	100%

Table 3 Values recorded in question 3

Source: Own Elaboration

3. . How do you consider the care provided by the person in charge of the Physics Laboratory?



■ Excellent ■ Good ■ Regular ■ Bad

Results → Excellent: 47 people, Good: 101 people, Regular: 12 people, Bad: 9 people.

Graphic 3 Results of question 3

Source: Own Elaboration

Interpretation of the data obtained in question 3:

It can be established that the care provided by the person in charge of the Physics Laboratory is "Good".

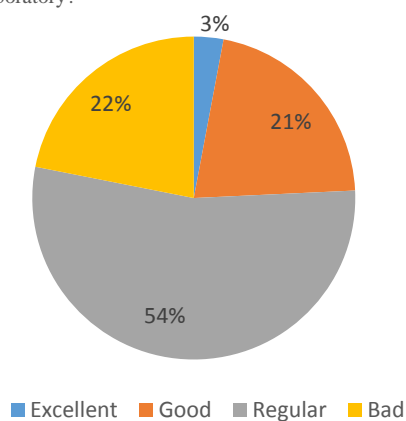
On the other hand, in question 4 the service of the safeguarding of belongings is evaluated during the stay that the user has within the Laboratory.

4. How do you consider the service of safeguarding your belongings during your stay at the Physics Laboratory?		
Answers	Opinions	Percentage
Excellent	5	3%
Good	36	21%
Regular	91	54%
Bad	37	22%
Total	169	100%

Table 4 Values recorded in question 4

Source: Own Elaboration

4. How do you consider the service of safeguarding your belongings during your stay at the Physics Laboratory?



Results → Excellent: 5 people, Good: 36 people, Regular: 91 people, Bad: 37 people.

Graphic 4 Results of question 4

Source: Own elaboration.

Interpretation of the data obtained in question 4:

The survey participants consider that the safeguarding of their belongings during their stay in the Physics laboratory is “Regular”.

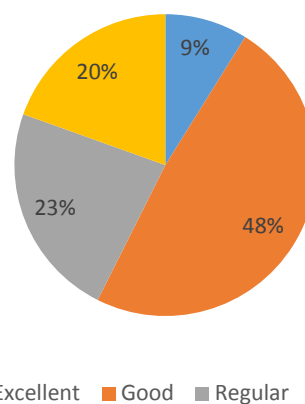
Undoubtedly, the regulatory part of any space contributes considerably to providing a good service, since it encourages the proper use of the facilities and everything that is found in them, that is why, question 5 considers the part regulations of the Physics Laboratory.

5. How do you consider the application of the regulations of the Physics Laboratory?		
Answers	Opinions	Percentage
Excellent	15	9%
Good	82	48%
Regular	39	23%
Bad	33	20%
Total	169	100%

Table 5 Values recorded in question 5

Source: Own Elaboration

5. How do you consider the application of the regulations of the Physics Laboratory?



Results → Excellent: 15 people, Good: 82 people, Regular: 39 people, Bad: 33 people.

Graphic 5. Results of question 5

Source: Own Elaboration

Interpretation of the data obtained in question 5:

It is determined that the application of the regulations in the Mechanical and Electrical Laboratory is "Good".

Among the questions asked, question 6 was formulated in order to obtain information through comments, suggestions or observations regarding the Physics Laboratory, it is important to mention that said question was established in order to collect data that later allow the design of improvements based on antecedents, which well formulated could be implemented within it. Table 6 contains the responses obtained.

6. According to your personal criteria and for academic purposes, would you like to make any comments, suggestions or observations about the Physics Laboratory?

The users participating in the survey state within their needs:

- Acquisition of New Furniture and Equipment.
- Increase of practices within the laboratory.
- Material available for practices.
- Creation of a Manager for both shifts.

Table 6 Values recorded in question 6.

Source: Own Elaboration

Interpretation of the data obtained in question 6:

As previously mentioned, the purpose of this question is to obtain information based on direct opinions of the user, at the time of the interpretation of the answers it was possible to arrive at the analysis of a generation of research lines, which to give continuity to the This work can generate improvement designs and in turn considerably increase the desired quality levels. Finally, it is of the utmost importance for any Institution to have facilities that cover and satisfy the needs of each individual belonging to the Academic Community, in this case those belonging to the Faculty of Electrical Mechanical Engineering, that is why it is posed in the question number 7 qualify the degree of satisfaction that the user has regarding the Physics Laboratory.

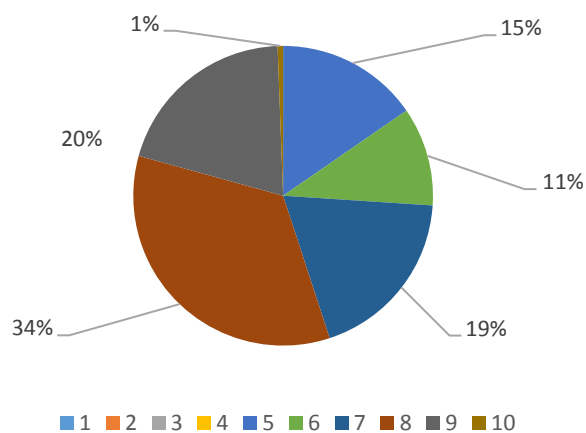
Below is each of the ratings assigned by the 169 survey participants.

Qualification	Frequenci
1	0
2	0
3	0
4	0
5	26
6	18
7	32
8	58
9	34

Table 7 Values recorded in question 7

Source: Own Elaboration

7. On a scale of 1 to 10, with 10 being the highest rating and 1 being the lowest. How do you rate your level of satisfaction with the Physics Laboratory of the Faculty of Mechanical and Electrical Engineering?



Graphic 6 Results of question 7

Source: Own Elaboration

Interpretation of the data obtained in question 7:

Given the importance of obtaining current and realistic knowledge about the Laboratory's qualification, all this for academic purposes can be established that 34% of the sample considers that the degree of satisfaction provided is equivalent to an qualification of 8.

Importance of the Data Obtained.

The importance of the data obtained lies in the analysis of the basic elements of the information obtained.

Each of the results obtained in the present work, generate a real perspective of the degree of satisfaction of the users who go to the Physics Laboratory of the academic entity, in turn it is considered that the research is acceptable due to the favorable responses obtained, However, given the current demand of the educational world, it is necessary to design strategies that promote continuous improvement in each of the evaluated aspects, which in due course can be implemented in order to increase the levels previously obtained and thus achieve the desired quality to later achieve excellence.

Conclusions

Derived from the investigation it is concluded:

- This research generates new current knowledge of the degree of satisfaction of the services provided in the Physics Laboratory.
- This work opens the possibility of creating analysis of each of the areas of the Faculty of Electrical Mechanical Engineering, this in order to implement strategies that allow solving the problems that are obtained.
- After making each of the conclusions in the respective questions, we can identify that there are areas of opportunity in which to work later.

Finally, it is important to highlight that the time invested in this work achieves the scope established at first, which lies in generating new knowledge within this area, on the other hand, one of the limitations with which it had to be dealt with. It is focused on the current health situation, all this because the students are taking each of their classes remotely, however, every Educational Institution has to adapt to certain conditions, likewise, the Faculty of Electrical Mechanical Engineering is characterized for being a dependency accredited by quality organizations that guarantee the quality of its educational programs and the teaching that is taught through them, in the same way to highlight that the line of work to be followed as an Institution of Higher Education is to work with quality to achieve excellence.

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