Virtual environments for the practical training of ICT engineering students: supported by the e-learning modality

Entornos virtuales para la formación práctica de estudiantes de ingeniería TIC: apoyados en la modalidad e-learning

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Abstract

This work consists of a mixed-type investigation that consists of the development of digital materials for teaching-learning through a digital platform, for the academic performance of the students of the engineering career in information technologies of the ninth semester of the Technological University of the South of Sonora.

Resumen

Este trabajo consiste en una investigación de tipo mixto que consiste en el desarrollo de materiales digitales para la enseñanza-aprendizaje a través de una plataforma digital, para el rendimiento académico de los estudiantes de la carrera de ingeniería en tecnologías de la información del noveno semestre de la Universidad Tecnológica del Sur de Sonora.

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† Researcher contributing as first author.

Introduction

In the Technological University of the South of Sonora there have been some situations with engineering students in information and communication technologies regarding the attention of transversal subjects, they give them little importance and attend them in a simple way, because they already work and They do not arrive on time because they are in the first hours of attention in the afternoon.

This is due to the fact that the time of entry is at 3:00 pm and that due to the model of technological universities that is 70% practical and 30% theoretical, they become confused and due to this situation they do not give it the necessary importance and tend to failing even to fail the subjects for the above, a possible solution is presented in this regard. (www.uts.edu.mx, 2020).

This condition seems necessary in some cases, to support the gratuity in others, since a project of costs and investment expenses must be developed in the headquarters, centers and nuclei involved. The consideration of all these elements can guide and guarantee quality work in online and distance education.

In the Technological University of the South of Sonora (UTS), in 2009 the continuity of studies from University Higher Technical level to Engineering in: Business Development and Business Management, Information Technologies, Production Technologies and Technologies began. of Automation, which has increased enrollment and in the face of this situation, needs and priorities are generated, such as the growing demand for new entrants to engineering and the installed capacity to serve students.

In our institution, in the development of its educational model, it foresees an institutional strategy for the fulfillment of its mission and vision, and takes into consideration fundamental aspects in the teaching-learning process, as established by the Quality Assessment Model of the Education Subsystem. Technological Universities.

This university openly faces the use of new trends that are important to accelerate the adoption of technology in higher education. Modalities as Mixed Modality in Information Technology and Communication Engineering (I.T.I.C).

As a point of reference, the results obtained at the Technological University of Fidel Velázquez, with the implementation of the Mixed Modality, have made it possible to considerably increase enrollment from 88 to 510 students at the engineering level during the transition process of the educational model. For more detailed information, see Graph 1.

Behavior engineering program
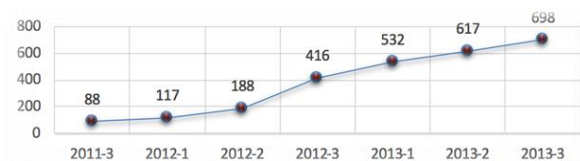
Graphic 1 Behavior engineering program
Source: Fidel Velázquez Technological University Income Statistics (2014)

Therefore, when analyzing the growth of enrollment in a technological university that transitioned to the Mixed Modality in engineering, it can be seen that this modality offers study opportunities to people who are actively working, since it is flexible with schedules and takes advantage of communication technologies. information. This University openly faces the use of new trends that are important to accelerate the adoption of technology in Higher Education. Modalities such as Mixed Learning, Flipped Classroom and Distance Learning.

For this reason, this proposal intends to carry out the promotion of the material of the cross-sectional engineering subject in a Virtual Learning Environment (EVA) with the purpose of making available several courses that are useful for students of Information Technology Engineering and Communication (ITIC), and that serve as exploratory courses, for the development of other courses.

In this proposal, the courses are proposed in the Moodle platform used by the University as a feasible option for accreditation of compulsory theoretical subjects of the terminal stage of the (ITIC) career The constructivist pedagogical proposal where the student is responsible for their learning, accompanied by a tutor, with a competency-based and student-centered approach.

The proposal as a whole is integrated by technology, materials for subjects, human resources such as tutors, administrative, teaching and operational staff. Incorporate an EVA to the teaching practice in the transversal subject, in order to serve students in the last semesters of engineering in Information and Communication Technologies who cannot attend the UTS in person.

Justification

Offering subjects remotely through the Modular Object-Oriented Dynamic Learning (MOODLE) platform is intended for students to participate and study according to their own time. A Virtual Learning Environment (EVA) is ideal for expanding subjects. From the aspect of the subjects, its type facilitates the development of contents.

It allows students to manage and promote their time, advance adequately in the program, in addition to participating in an EVA that allows them to expand skills and technological competencies, and is a viable alternative because all students in the subjects have access to technology. (Lap-top, Tablet, Cell phone and internet). The transversal subjects have been worked on both face-to-face and semi-face-to-face, which is an indicator of progress to work online.

The context of the problem the transversal subjects belong to the stage of the educational program of Engineering in Information and Communication Technologies. The transversal subjects are theoretical subjects, which becomes a challenge with engineering students who only want to study practical subjects, everything else sounds like padding. Despite this, the subjects have been maintained even with the change of plan.

The students enroll in the transversal subjects, in the seventh, eighth, ninth and tenth quarters, they are mostly men (no more than three women per group) their ages range between 21 and 23 years. Most of them have a company job. They have an evening schedule for most subjects.

In addition, the case of students who participate in student mobility and wish to study the subject at a distance is presented. The students in general, due to the profile of the career, are not very participative, they are also used to practical subjects, programming; they like to work on projects, they don't like to speak in public, they don't like to have debates, and although they have the knowledge they avoid the part of the voluntary participation, they have to be invited by name to participate in front of the group, and still their answers are too concrete.

The challenge is for students to participate in the subjects, not just to take them and pass them. Approximate number of students enrolled in the subject between 20 and 25, most of the students have had experiences in the institutional platform, since they are in the last semesters, they work most of the time on projects autonomously, and they only present themselves to the subjects in some opportunities to deliver advances and consult doubts with their advisors. And they intend to do the same in these subjects.

The Technological University of Southern Sonora (UTS) is a public university in Ciudad Obregón, Sonora Mexico and has five campuses: in Sonora. It serves around 3,000 students and 300 employees between teachers and administrators: at the Cd. Obregón campus. Transversal subjects are taught in the Information Technology Engineering career, with an average of 30 students per semester, attended by 2 teachers every four months.

In Cd. Obregón, the subjects are currently taught in person and the other faculties must be the same or at least the institutional platform is not being used, since there is no record of activation of these subjects in Moodle. The UTS promotes the implementation of a flexible education approach, focused on student learning.

Regarding the use of ICT, Moodle is the institutional platform (http://campusvu.uts.edu.mx/login/index.php) with the guidelines to activate courses and evaluate content for the distance modality. Through the institutional platform Moodle seeks to maintain communication between teachers and students and promote the learning process, in addition to supporting academic activities with ICT.

There is sufficient and adequate technological infrastructure for the creation and development of the activities of the subjects, with sufficient bandwidth and computer laboratories equipped with updated equipment and software in each laboratory, as well as an institutional computer center. Within the Campus there is also a wireless Internet signal which makes it easier for students to connect to Moodle.

Problem statement

The transversal subjects are offered in the four semesters of the Information Technology Engineering educational program, they are theoretical subjects, and are offered in the morning; Most of the students are already working, so absenteeism in them leads them to drop out or to obtain low grades.

Objective

Overall objective

Develop an alternative proposal for the transversal subjects of ICT engineering, through a virtual environment that facilitates and accompanies the learning of the students of the ICT career.

Specific objectives

- Plan and prepare the didactic material that will plan the academic work that the student must carry out to gradually develop the competences proposed in the profile in the transversal subjects designed by the teachers.

- Facilitate the Teaching-Learning process with tutorial follow-up and where technologies mediate so that students integrate into the ICT field.

- Apply the criteria for diagnosis and evaluation of the learning of the activities and tasks reported by the students of the subject according to the Virtual modality.

Hypothesis

A correlational hypothesis has been generated between the b-learning variables and academic performance.

Using the b-learning methodology has a positive impact on the academic performance of ICT Engineering students in the transversal subject.

Variables

Independent variable: B-Learning

For Sanz and others (2009), b-Learning means the combination of face-to-face teaching with Web technologies, that is, those learning processes carried out through digital networks where face-to-face sessions are established that promote face-to-face contact.

Dependent variable: Academic performance

For Jiménez (2000), academic performance is a "level of knowledge demonstrated in an area or subject compared to the norm for age and academic level. For this research, academic performance is based on this definition and will be measured through the results of the experimentation instruments, which will be developed to make use of this tool.

Methodology

The research is carried out at the Technological University of the South of Sonora, in Cd. Obregón, Sonora, the ICT engineering groups of the seventh, eighth, ninth and tenth semesters are considered for this research, where transversal management-level subjects are taught. one in each quarter.

The objective of this research is to examine the Blended Learning methodology and how it intervenes in the academic exercise of students, this research is in a context of educational innovation, so the benefits that will be compensated in students with its application must be analyzed.

To carry out, it is considered to do an experiment that validates it on the Blended Learning methodology, differentiating the information generated with the focus groups related to the transversal subjects that use the Blended Learning methodology.

This research is solved through quantitative methodology, combined in some cases with qualitative methodology.

Three types of scientific research can be distinguished referring to three epistemological-methodological approaches to doing research: the quantitative approach typical of the natural sciences, which was extended to the social sciences; the qualitative approach that emerged from the social sciences as a different response to doing science without resorting to quantitative methods; Finally, there is talk of a third approach that some call mixed, multi-method or total. (Hernandez, 2010).

Before properly defining mixed methods, they add more followers every year and their development during the first decade of the 21st century has been vertiginous. They have received various names such as integrative research (Johnson and Onwuegbuzie, 2004), and mixed research (Tashakkori and Teddlie, 2009; Plano and Creswell, 2008; Bergman, 2008; and Hernández and Mendoza, 2008).

Some of the most significant definitions of the mixed approach or mixed methods would be the following:

1. Mixed methods represent a set of systematic, empirical and critical research processes and involve the collection and analysis of quantitative and qualitative data, as well as their integration and joint discussion, to make inferences as a result of all the information collected (meta-inferences).) and achieve a better understanding of the phenomenon under study (Hernández and Mendoza, 2008).

2. Mixed research methods are the systematic integration of quantitative and qualitative methods in a single study in order to obtain a more complete "photograph" of the phenomenon.

These can be brought together in such a way that the quantitative and qualitative approaches retain their original structures and procedures ("pure form of mixed methods"). Alternatively, these methods can be adapted, altered, or synthesized to conduct research and deal with study costs ("mixed methods modified form") (Chen, 200G; [ohnson et al., 2006).

Hernández and Mendoza (2008), who in turn took into account the classification of Teddlie and Tashakkori (2006) in relation to the mixed part. The quantitative and qualitative methods are monomethodical (they imply a single method). Mixed methods, as has been pointed out, are multi-method, they represent the "third way" (Hernández and Mendoza, 2008).

Hypotheses

A correlational hypothesis has been generated between the b-learning variables and academic performance. Using the b-learning methodology has a positive impact on the academic performance of ICT Engineering students

Independent Variable: Use of Technology

Variable

Mentoring and advice

(Academic achievement)

Dimensions

Use of technology

Teamwork

Indicators

Participation in academic activities.

Compliance activities

Ratings

Instruments

Checklist (academic performance of student groups)

Documentary analysis (Documentary file)

Dependent variable

Tutoring and Counseling

Variable

Use of technology (b-learning)

Dimensions

Class planning with b-learning

Technological resources used in the EVA of pedagogy

Indicadors

Syllabus

Tools

Access

Connection

Virtual platform

web communities

Methodology

Tutorships

Evaluation

Instruments

Checklist (resource availability)

Questionnaire (applied to UTS students, on the methodology applied by the teacher)

Scope and Research Design

The current study will be carried out at the Technological University of the South of Sonora, during the last year of engineering studies and will be applied to students in the ninth semester who will finish their studies in the semester May - August 2020.

Population

The population of the present investigation is made up of the Students of the Technological University of the South of Sonora, of the Career of Information Technologies specifically of engineering.

Sample

The sampling technique will be intentional, non-probabilistic. This will be made up of 100% of the total number of students who attend the transversal subject taught in the Information Technology Engineering career, with a total of 30 students and as a sample the 30 students.

To carry out the diagnosis of the Blended Learning methodology applied in the Technological University of the South of Sonora, a survey was designed and applied, in which the following Population of 100% of students of 9th semester was considered

Criteria

The study was carried out at the Universidad Tecnológica del Sur de Sonora with the students of Engineering in Information and Communication Technologies of the last semester, with the subject of business negotiation. This is because it is one of the transversal subjects and it is one of the first in its evening hours, engineering is in the afternoon, because when students leave their university higher technical level, they are placed in companies to do the stays and in several cases they stay to work, so some students do not make it to the first hours of classes since they start at 3:50 pm in addition to not giving it much importance because they are administrative or managerial role matters. Due to the above, the study is made of engineering students who take transversal subjects in the early hours of the afternoon to offer them semi-face-to-face because they are 3 hours a week and they could take two virtual and one face-to-face. With this they would take more advantage of the topics and would credit more easily.

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In addition to taking care of the permanence and increasing the enrollment in engineering because with the case of the Universidad Tecnológica de Fidel Velázquez, we remain as a reference to apply the same strategies of applying executive engineering, that is, working with engineering students on Fridays 6:00 pm to 10:00 pm and Saturday from 9:00 am to 7:00 pm With this strategy, young people can fulfill their work and their classes, in addition to respecting what is established by the General Coordination of Technological Universities, which is that young people practice in the workshops, either with dual or blended education, but it is not allowed 100% virtual.

Resources

Full-time professors from the IT engineering program are available to develop digital materials.

The academic body of the educational program has the necessary resources (financial and technological) to carry out the activities of this work.

It also has a line of research called development of digital and multimedia materials.

There are adequate technical specifications for the implementation of semi-face-to-face education, with sufficient bandwidth and dedicated servers for the corresponding applications. In addition; There are computer rooms and wireless internet, as shown in the interviews and checklists made to those in charge of computer centers and communications sites.

Measurement tools

This research, in general, is solved with a quantitative research methodology, adopted in some cases with qualitative methodology.

This is due to the type and characteristics of the research:

1. To carry out the diagnosis of the Blended Learning methodology applied at the Universidad Tecnológica del Sur de Sonora, the research methodology used is quantitative, not experimental. (Questionnaire and Checklist)

2. To establish the levels of association developed by the application of the Blended Learning methodology, the research methodology used is quantitative quasi-experimental. (Checklist)

3. Finally, in the case of the teaching technicians who support the computer laboratories, they were interviewed with a checklist to verify the state of the technology available to the UTS.

Carrer
Course
Teacher
Date
Indicators forever = 3
Usually = 2
Rarely =1
Never = 0

Table 1 Checklist 1 for students

1. Manages digital information in the contents in several

2. Shapes.

3. Possesses information research skills on the Internet.

4. He makes writings, exhibitions and other archives in programs.

5. Participate in forums, chat and internet activities.

6. Run research on virtual library databases.

7. Make exhibitions supported by technological resources.

8. Manage mobile devices for academic actions.

9. Use mobile devices for academic activities works collaboratively.

10. They have good communication between team members.

11. They use web resources to do teamwork.

12. Suggest ideas for work improvement.

13. He performs his part of the work on time in the terms.

14. Agreed.

15. Favorably performs research projects classroom.

16. Participate in extracurricular academic activities.

17. Favorably performs the activities arranged.

18. Execute your work with a good level of quality.

Universidad Tecnológica del Sur de Sonora

Objective: To establish the B-learning methodology applied at the Universidad Tecnológica del Sur de Sonora.

Career
Course
Teacher
Date
Responsible

Respond yes no partially

No. Tools usable in the classroom

1. Has computer equipment.

2. It has an image projector.

3. It has a digital screen.

4. It has an audio system.

5. It has wireless internet system.

6. It has a wired internet system.

7. It has enough electrical connections.

No. Tools usable in college.

8. How much free internet access service?

9. It has an online academic management system.

10. It has access to a virtual platform.

11. It has access to virtual libraries.

12. It has an institutional repository to host and consult research.

13. They have institutional mail for teachers

14. They have institutional mail for students

15. Forums or virtual conferences are held to share knowledge

16. Students have mobile technological resources

17. Access to web communities is free (Facebook, WhatsApp, YouTube)

18. They have free electrical installations

Technological University of Southern Sonora

Illustration 3 Survey 1

Career:

Survey addressed to engineering students at the Technological University of the South of Sonora.

Specific objective: To establish the B-Learning Methodology used in the Technological University of the South of Sonora.

1 From your point of view, what level of importance deserves the use of web resources as didactic support in the teaching-learning processes?

Necessary

Optional

Not applicable

2 Does the teacher plan activities in virtual learning environments?

Yes

No

3 With what continuity does the teacher plan activities in virtual learning environments?

Repeatedly

Casually

Little usual

Does not use

4 What platform does the teacher use to advance their virtual activities?

Moodle

Dakeos

Chamilo

5 Does the bibliography contain electronic information services such as: books, magazines, articles, videos?

Yes

No

6 What percentage is there between the physical and electronic bibliography?

Physics – Electronics

80% 20%

60% 40%

50% 50%

40% 60%

20% 80%

7 Do you use virtual library databases in the planning and progress of activities?

Yes

No

8 Are academic activities planned in Blogs, forums, wikis, Chat?

Yes

No

9 Have video conferences been scheduled for exhibitions?

Yes

No

10 Are web communities created (Facebook, LinkedIn, Twitter, Google apps) for the reciprocity of information and communication between teachers and students?

Yes

No

11 What are the most used applications in web groups for communication and exchange of information?

Facebook

WhatsApp

LinkedIn

Twitter

Googleapps

Youtube

12 Is the use of mobile devices (Tablet, Smart Phone) allowed to develop academic activities in the classroom?

Yes

No

The teacher

13 Is the data cloud used to place and share electronic files between teachers and students?

Yes

No

14 Do you use the institutional repository of the University as a reference source for your work?

Yes

No

15 Are electronic data collection materials (online surveys) used in research projects?

Yes

No

16 Are the results of the investigations published in any Web resource?

Yes

No

Some cases

17 The technological tools provided by the university (PC, Lap Top tablets) are considered to be:

Enough

Insufficient

18 Internet access provided by the university for free use by students is considered:

Very good

Okay

Unsatisfying

Deficient

19 How do you observe the methodology used by the teacher in the progress of the b-Learning activities?

Very good

Good

Unsatisfactory

Inadequate

20 How do you observe the accompaniment of the teacher in the b-Learning activities?

Very good

Okay

Unsatisfying

Deficient

21 How do you evaluate the b-Learning practice within your academic training process?

Very good

Good

Unsatisfactory

Deficient

22 Do you think that the b-Learning methodology increases your academic performance in the following ways:

Very eloquently

Eloquently

Little bit

It doesn't make it better

Illustration 4 Checklist 1

Specific objective: To establish the B-Learning Methodology used in the Technological University of the South of Sonora.

1 From your point of view, what level of importance does the use of web resources deserve as didactic support in the teaching-learning processes?
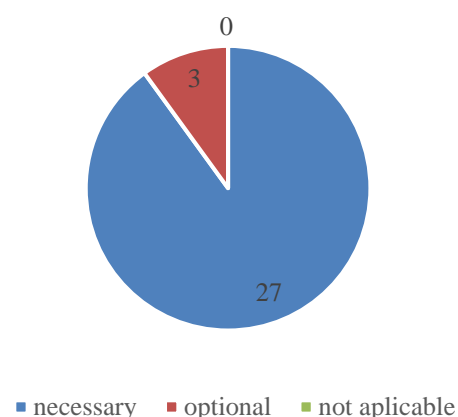
Graphic 1 Represents the answer to question 1

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In the answer to question number 1 of the survey addressed to ICT engineering students, they state that the use of web resources as a didactic support in their teaching-learning process is necessary, giving as a necessary answer 27 students out of 30 that make up the group.

Analyzing the data received, it can be identified that students, due to their current characteristics, do use web resources to take advantage of their learning.

By way of inferring the results, it can be said that in the future it will be an essential requirement that students entering this degree have mandatory use of ICT.

2 Does the teacher plan activities in virtual learning environments?

yes ■ no
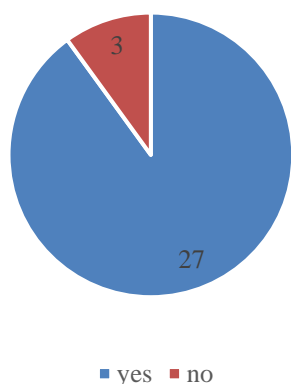
Graphic 2 Represents the answer to question 2

In the answer to question number 2 of the survey addressed to ICT engineering students, they state that the teacher does plan activities in EVA, 27 students out of 30 declare so, making it clear that the teacher has the necessary skills for their job.

Analyzing the data received, it can be identified that teachers have the necessary skills to use web resources.

By way of inferring the results, it can be said that in the future teachers will be able to update themselves more quickly and apply it to their digital materials.

3 With what continuity does the teacher plan activities in virtual learning environments?

3. Represents the answer to question 3

casually ■ repeatedy ■ little usual
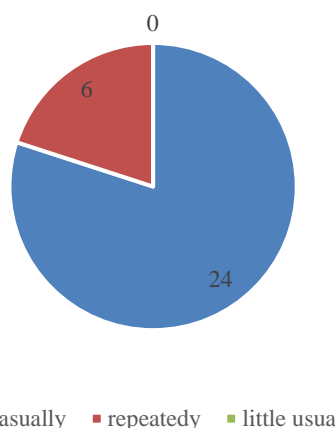
Graphic 2 Represents the answer to question 2

In the answer to question number 3 of the survey addressed to ICT engineering students, 24 state that the teacher casually plans virtual activities, and 6 of them respond quickly.

Analyzing the data received, it can be identified that the teachers plan it casually because their participation is once a week because they are subjects of 3 hours a week.

As a way of inferring the results, it can be said that the teachers will continue to do it in the same way in the future, because this is the UTS program, two virtual hours and one face-to-face.

4 What platform does the teacher use to advance their virtual activities?

■ Moodle ■ Dokeos ■ Chamilo
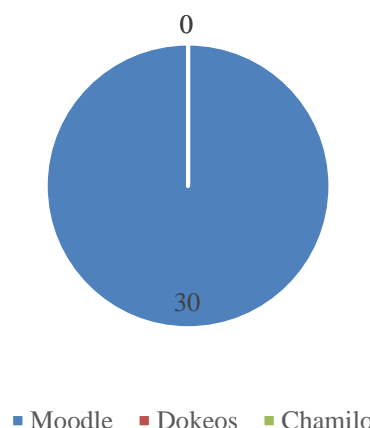
Graphic 4 Represents the answer to question 4

In the answer to question number 4 of the survey addressed to ICT engineering students, the 30 students in the control group state that the teachers use the Moodle platform, ruling out the Dokeos and Chamilo platforms.

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By analyzing the data received, it can be identified that teachers use the Moodle platform, because it is a free platform, in addition to being used since the beginning of the UTS, in addition to the fact that it is from the platform that they have received training from its updates.

As a way of inferring the results, it can be said that teachers will continue to do it in the same way in the future, because, by fine-tuning their skills in handling this technology, it will be easier for them to use it over time.

3 Does the bibliography contain electronic information services such as: books, magazines, articles, videos?
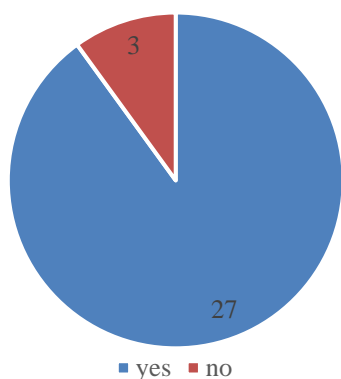
Graphic 5 Represents the answer to question 5

In the answer to question number 5 of the survey addressed to ICT engineering students, 27 out of 30 students state that they do have digital materials to prepare their work.

By way of analysis of the data obtained, it can be said that students can access digital information both on the internet and in the databases of the professional residency jobs of UTS graduates.

For in the future it can be inferred that all students will be able to access these materials, because they will have more bibliography and laboratories available with the Internet.

4 What percentage is there between the physical and electronic bibliography?

Physics – Electronics

80% 20%

60% 40%

50% 50%

40% 60%

20% 80%
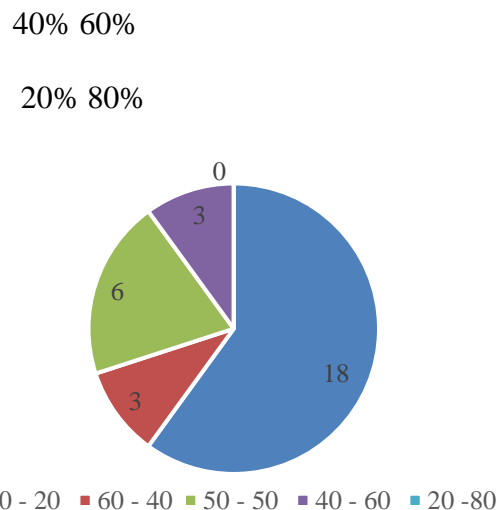
Graphic 6 Represents the answer to question 6

In the answer to question number 6 of the survey addressed to ICT engineering students, they state that there is 80% electronic bibliography and 20% physical bibliography; evidencing that they have the necessary materials for their online work.

Analyzing the data obtained, it can be said that more dissemination should be done among students regarding the digital materials that the university has for free access by students.

Likewise, it can be inferred that in the future young people will be able to access a higher percentage of digital materials.

7 Do you use virtual library databases in the planning and progress of activities?
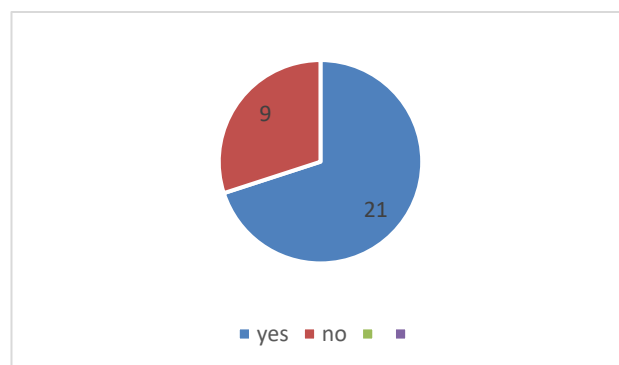
Graphic 7 Represents the answer to question 7

In the answer to question number 7 of the survey addressed to ICT engineering students, 21 students out of 30 state that they use virtual library databases in the planning and progress of their activities.

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By analyzing the data obtained, we can identify that in order to get all students to use virtual platforms, training and information about them may be necessary. By inferring the results we can say that in the future all young people will be consulting virtual libraries.

8 Are academic activities planned in Blogs, forums, wikis, Chat?

■ yes ■ no ■ ■
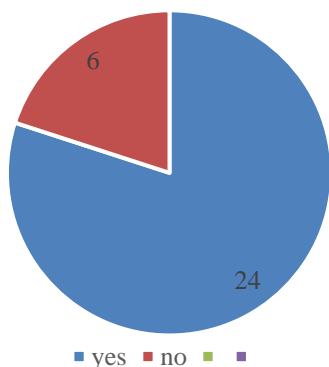
Graphic 8 Represents the answer to question 8

In the answer to question number 8 of the survey addressed to ICT engineering students, 24 out of 30 students state that academic activities are planned in blogs, forums, wikis and chat.

By analyzing the data obtained, the interaction of students and teachers with technological tools is identified.

From what can be inferred from the previous results in the interaction of students with teachers through academic activities attended through forums, blogs, among others, will contribute to the development of new learning skills.

9 Have (Video conferences) been scheduled for exhibitions?

■ yes ■ no ■ ■
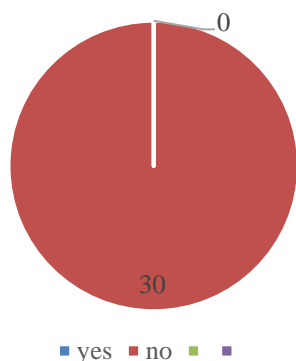
Graphic 9 Represents the answer to question 9

In the answer to question number 9 of the survey addressed to ICT engineering students, the 30 students in the control group state that they have not held videoconferences for exhibitions.

When analyzing the data obtained in this question, it is identified that they do this in person, due to the fact that the subject program requires it.

By inferring from the above data, we can say that with the demand for the programs and needs that this program requires, videoconferences for this subject should be given.

10 Are web communities created (Facebook, LinkedIn, Twitter, Google apps) for the reciprocity of information and communication between teachers and students?

■ yes ■ no ■ ■
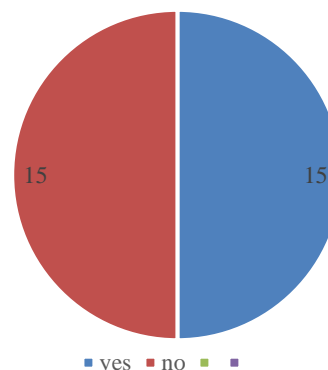
Graphic 10 Represents the answer to question 10

In the answer to question number 10 of the survey addressed to ICT engineering students, 15 out of 30 students state that they do make web communities and the other 15 mention that they do not.

When analyzing the data obtained, we can identify that according to the assignment of activities assigned in the subject program, sometimes it is required and sometimes it is not. Likewise, it can be inferred from the above that in the future web communities will be able to be carried out in more subjects of the educational program.

11 What are the most used applications in web groups for communication and exchange of information?

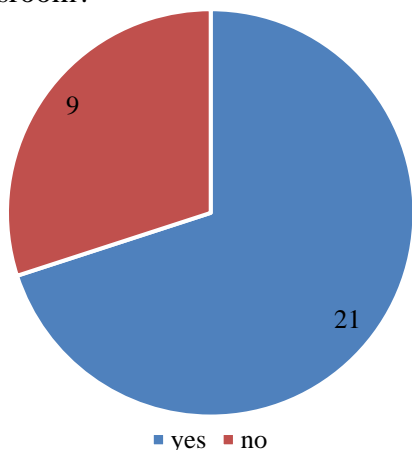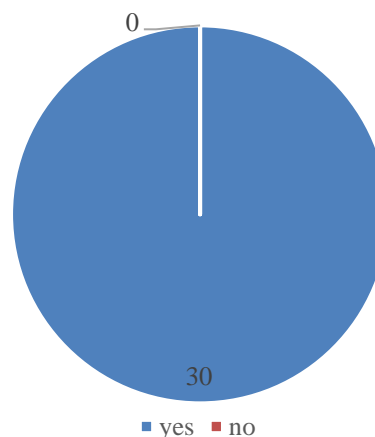WhatsApp, LinkedIn, Twitter, Googleapps and YouTube.
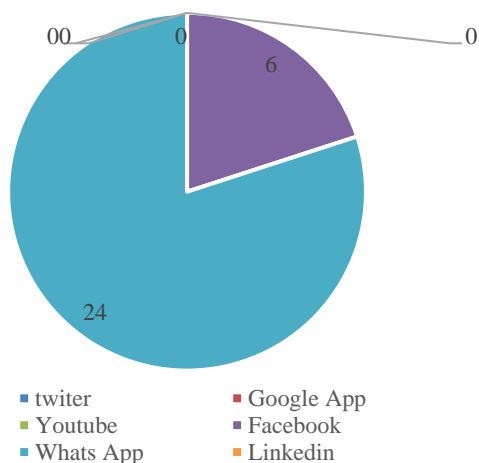
Graphic 11 Represents the answer to question 11

In the answer to question number 11 of the survey addressed to ICT engineering students, 24 students state that the most used app is WhatsApp, while 6 comment that Facebook and the rest of the Apps are not used for communication and communication. exchange information with their teachers and classmates.

When analyzing the data obtained in question 11, we identify that the rest of the social networks are not used by the vast majority because they are not required by their teachers, and also because they do not yet have the necessary qualifications or knowledge to use them. they.

In the future we can infer that they will be able to make use of all the social networks that are implemented here both to make themselves known as professionals as well as to complement their subjects.

12 Is the use of mobile devices (Tablet, Smart Phone) allowed to develop academic activities in the classroom?

Graphic 12 Represents the answer to question 12

In the answer to question number 12 of the survey addressed to ICT engineering students, 21 students state that they do use mobile devices in class and 9 do not.

When doing an analysis of the data obtained, we identified that due to the fact that they test web systems that they develop in the areas of programming and databases, not all students reach portable equipment, because handling them is for those who arrive. earlier or has one of its own.

It can be inferred from the above data that, in the future, each student will be able to have a computer for individual use, since equipment is required for the ICT career each year in the federal support programs.

13 Is the data cloud used to place and share electronic files between teachers and students?
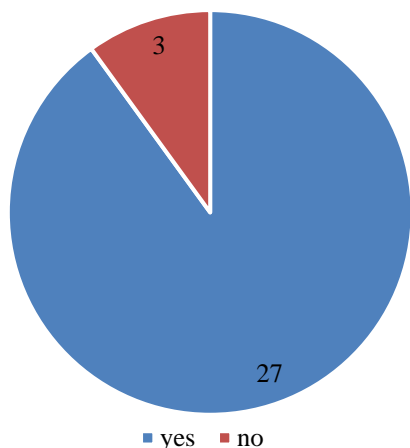

Graphic 13 Represents the answer to question 13

In the answer to question number 13 of the survey addressed to ICT engineering students, the 30 students state that they use the cloud to share jobs.
When analyzing the data obtained, it is identified that it again demonstrates the interaction with the teacher and students.

Where we can infer that the interaction between students and teachers through the cloud helps for the development of digital skills of our students and the optimization of delivery and response times of teachers.

14 Do you use the institutional repository of the University as a reference source for your work?

VAZQUEZ-MORENO, Erika Ercilia, VAZQUEZ-MORENO, Dolores Guadalupe, PORTELA-PEÑUÑURI, Luis Tadeo and TOLANO-GUTIERREZ, Karina. Virtual environments for the practical training of ICT engineering students: supported by the e-learning modality. Journal Applied Computing. 2022

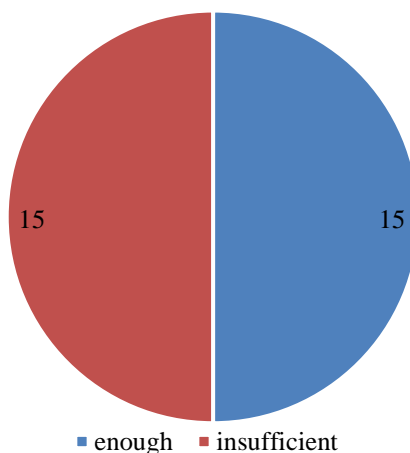**Graphic 14** Represents the answer to question 14

In the answer to question number 14 of the survey addressed to ICT engineering students, 27 students out of 30 state that they do use said repository. When analyzing the data obtained, we identified that it is one more tool for online consultation. So, we can infer that in the future all students will review this repository of digital materials.

15 Are electronic data collection materials (online surveys) used in research projects?
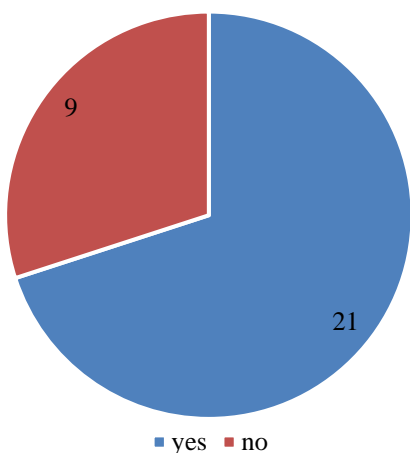
Graphic 15 Represents the answer to question 15

In the answer to question number 15 of the survey addressed to ICT engineering students, 21 students out of 30 state that they do participate in electronic data collection for research projects.

When analyzing the data obtained, we identified that not all students participate in research, it is according to their interest in the subject and the teacher is the one who chooses the students.

From what we can infer that in the future there will be more students who participate in the investigations, since most of them manifest it.

16 Are the results of the investigations published in any Web resource?
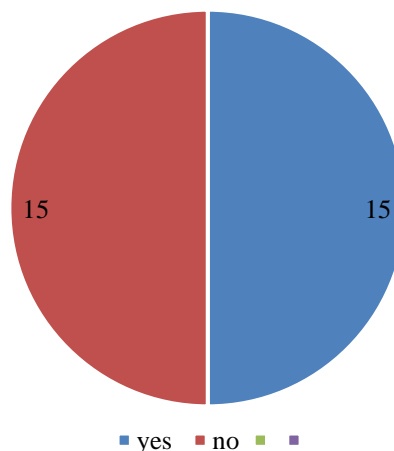
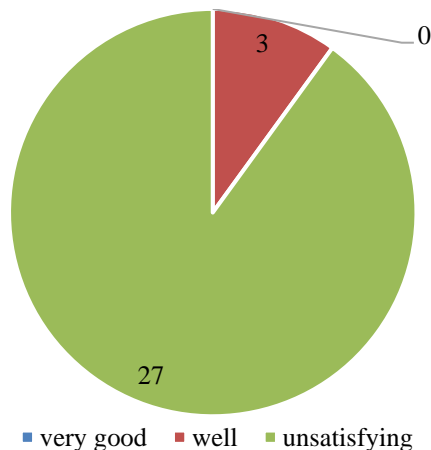**Graphic 16** Represents the answer to question 16

In the answer to question number 16 of the survey addressed to ICT engineering students, 15 say yes and 15 no.

When analyzing the results obtained, we identify that this is due to the fact that not everyone participates and also because not all articles are published due to lack of resources on occasions and sometimes due to lack of interest from the work team itself.

Therefore, it can be inferred that support should be generated for the publication of articles in which students participate; and this generates motivation for the publication of new articles.

17 The technological tools provided by the university (PC, Lap Top tablets) are considered to be:

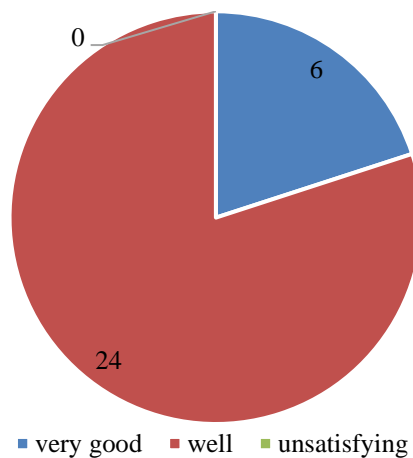**Graphic 17** Represents the answer to question 17

In the answer to question number 17 of the survey addressed to ICT engineering students, 15 state that they are sufficient and the other 15 that they are insufficient.

Analyzing the data obtained, this is due to the fact that the UTS equipment is not always in good condition or maintenance periods also enter the semester and this prevents the 30 students from having equipment in optimal conditions in all classes.

Making inference in the future, students will be able to count on individual equipment, recommending to the teaching technicians that they generate maintenance periods outside class hours.

18 Internet access provided by the university for free use by students is considered:

Graphic 18 Represents the answer to question 18

In the answer to question number 18 of the survey addressed to ICT engineering students, the 30 control group students state that the Internet is not very satisfactory. Analyzing the data obtained, it is identified that this is due to the fact that there are more and more users in the UTS, which requires an increase in bandwidth.

It can be inferred that, in the future, in addition to increasing the bandwidth, this resource will be managed with security policies and service management.

19 How do you observe the methodology used by the teacher in the progress of the b-Learning activities?

Graphic 19 Represents the answer to question 19

In the answer to question number 19 of the survey addressed to ICT engineering students, 27 out of 30 students state that the methodology used by the teacher is good.

When analyzing the data obtained, it is identified that this is an indicator to improve the B-Learning strategy currently implemented in ICT Engineering courses.

By inferring in the future, teachers will master the B-Learning methodology.

20 How do you observe the accompaniment of the teacher in the b-Learning activities?
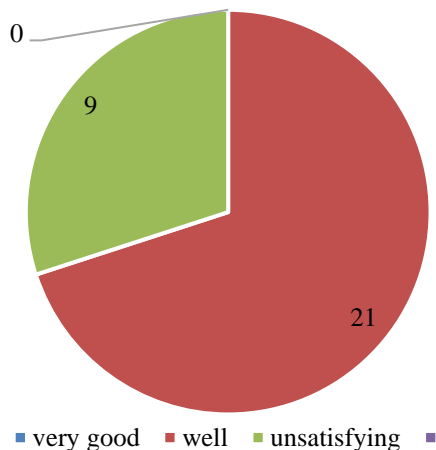
Graphic 20 Represents the answer to question 20

In the answer to question number 20 of the survey addressed to ICT engineering students, 24 students state that the teacher's accompaniment is good in the B-Learning methodology.

When analyzing the results obtained, we can identify that this is due to the fact that the teachers are in training regarding the virtual once a year.

So, it can be inferred that in the future the teacher's performance will be very good.

21 How do you evaluate the b-Learning practice within your academic training process?
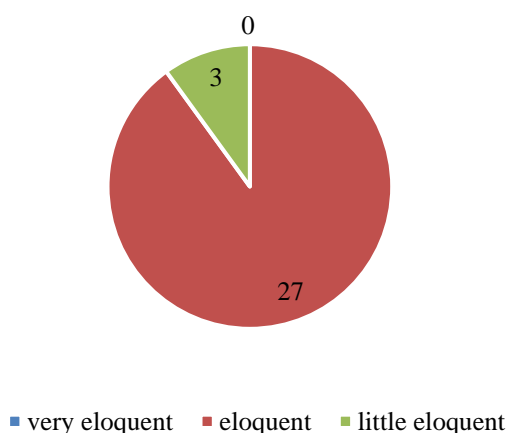

Graphic 21 Represents the answer to question 21
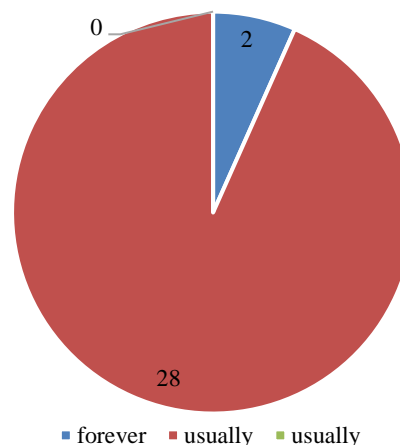
In the answer to question number 21 of the survey addressed to ICT engineering students, 21 out of 30 students state that B-Learning practice is good within their academic training process.

When analyzing the data obtained, it is identified that the continuous improvement of teachers to perform better in their mixed class through annual training, has improved the practice of the methodology.

So, it can be inferred that in the future the management of the B-Learning methodology will be very good.

22 Do you think that the b-Learning methodology increases your academic performance in the following ways:

Graphic 22 Represents the answer to question 22

In the answer to question number 22 of the survey addressed to ICT engineering students, 27 out of 30 students state that their academic performance eloquently increases.

When analyzing the data obtained, it can be identified that the use of technology has supported students to raise their academic performance, through the management of various information resources.

Therefore, it can be inferred that in the future the subject could be performed in its entirety virtually.

Illustration 2 Checklist 2

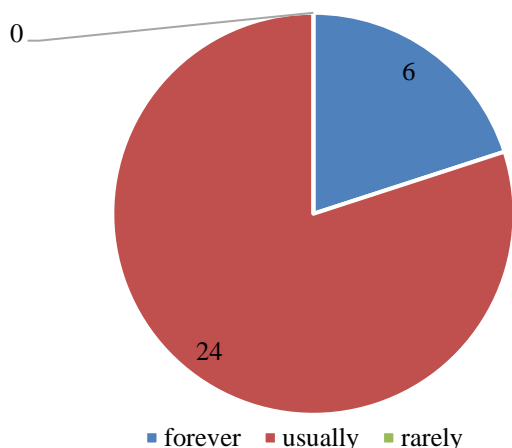1.-Do you manage digital information in the contents in various ways?

Graphic 23 Represents the answer to question 1 of checklist 2

In the answer to question number 1 of checklist 2 addressed to ICT engineering students, 28 out of 30 students state that they almost always handle digital information in various formats.

When analyzing the data obtained, it is identified that the students have the necessary skills to handle information online.

So, it can be inferred that this will facilitate their transition to b-Learning modality.

2.- Do you have information research skills on the Internet?

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forever ■ **usually** ■ **rarely**

Graphic 24 Represents the answer to question 2 of checklist 2

In the answer to question number 2 of the checklist addressed to ICT engineering students, 24 out of 30 students state that they almost always have the necessary skills to investigate information on the Internet.

When analyzing the data obtained, it is identified that it demonstrates as further evidence that students will be able to carry out their activities online when necessary.

Therefore, an inference is made that in the future it will be easier to perform in virtual classes.

3.- Do you make writings, exhibitions and other files in programs?

forever ■ **usually** ■ **rarely**
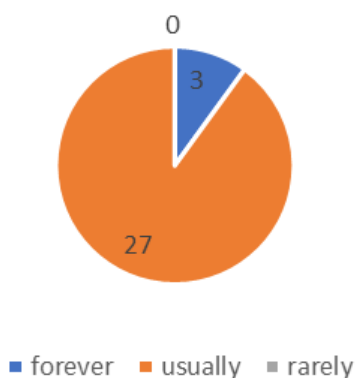
Graphic 25 Represents the answer to question 3 of checklist 2

In the answer to question number 3 of checklist 2 addressed to ICT engineering students, 27 out of 30 students state that they almost always make presentations and writings in different programs.

By analyzing the data obtained, we can identify as evidence the software management of different functions that students perform.

It is inferred that in the future a total of students will better handle computer tools.

4.- Do you participate in forums, chat and internet activities?

forever ■ **usually** ■ **rarely**
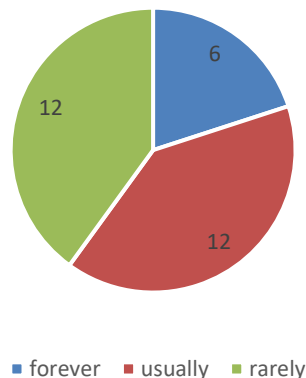
Graphic 26 Represents the answer to question 4 of checklist 2

In the answer to question number 4 of checklist 2 addressed to ICT engineering students, 6 students state that they always participate in forums and events on the Internet, 12 almost always and 12 rarely.

By analyzing the data obtained, we can identify that this is due to the fact that sometimes forums or events on the Internet have an economic cost that students are not always willing to pay.

To which it can be inferred that, in the future, events must be held or resources managed so that all students can access said events.

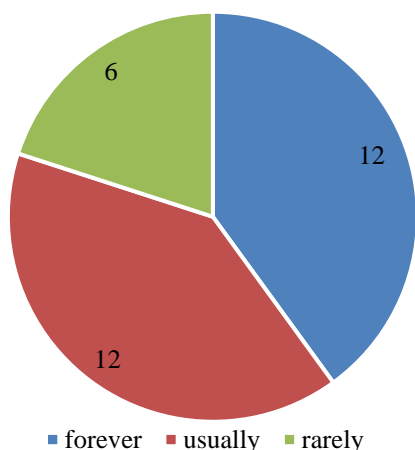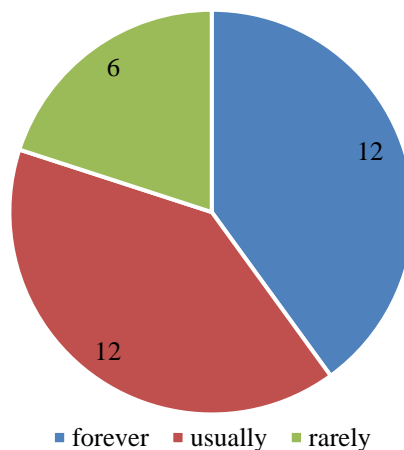5.- Do you carry out research on virtual library databases?
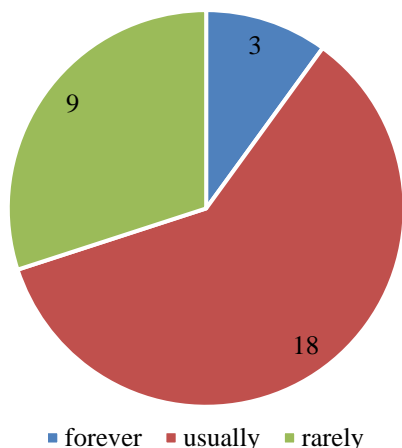
Graphic 27 Represents the answer to question 5 of checklist 2

In the answer to question number 5 of checklist 2 addressed to ICT engineering students, 18 out of 30 students state that they almost always use virtual library databases.

By analyzing the data obtained, we can identify that this is because it depends on the activity in which it is required and the skills of the students.

To which it can be inferred that in the future training should be done regarding the use of virtual libraries, so that a total of students can access these resources.

6.- Do you hold exhibitions supported by technological resources?

Graphic 28 Represents the answer to question 6 of checklist 2

In the answer to question number 6 of checklist 2 addressed to ICT engineering students, 12 state that they always use technological resources, another 12 almost always and 6 rarely.

By analyzing the data obtained, we can identify that this is because it is not always required, but there are students who, although not required, present it technologically.

To which it can be inferred that in the future the majority will do it in a technological way, because the indicator represents the average of the students.

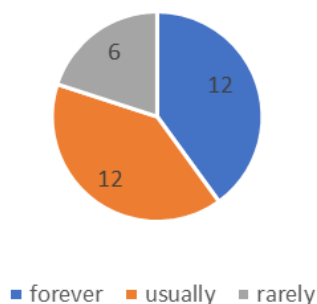7.- Do you use mobile devices for academic actions?

Graphic 29 Represents the answer to question 7 of checklist 2

In the answer to question number 7 of checklist 2 addressed to ICT engineering students, 12 students state that they always use mobile devices, another 12 almost always and 6 rarely.

By analyzing the data obtained, we can identify that this is due to the fact that not everyone has mobile devices and those that the university has are not always in good working order.

To which it can be inferred that in the future a preventive and corrective maintenance plan should be made so that all students have individual equipment.

8.- Do you use mobile devices for academic activities? Graph 30. Represents the answer to question 8 of checklist 2
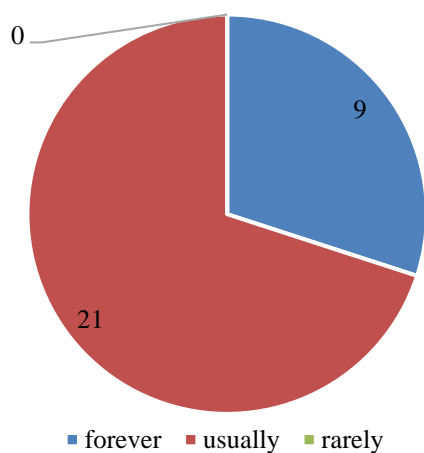
forever ■ usually ■ rarely

Graphic 30

In the answer to question number 7 of checklist 2 addressed to ICT engineering students, 12 students state that they always use mobile devices, another 12 almost always and 6 rarely.

By analyzing the data obtained, we can identify that this is due to the fact that not everyone has mobile devices and those that the university has are not always in good working order.

To which it can be inferred that in the future a preventive and corrective maintenance plan should be made so that all students have individual equipment.
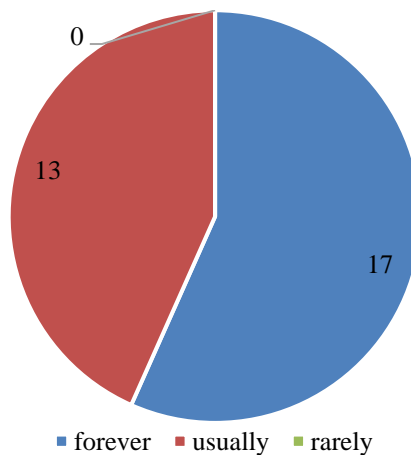
9.- Do you work collaboratively?

forever ■ usually ■ rarely

Graphic 31 Represents the answer to question 9 of checklist 2

In the answer to question number 9 of checklist 2 addressed to ICT engineering students, 9 out of 30 students state that they always work in a team and 21 that they almost always work in a team.

Analyzing the data obtained, we identified that this is due to the fact that most of the students eventually work and it is difficult for them to work as a team due to their work schedules.

To which it can be inferred that in the future all the students will work and must improve the balance of their times so that they can perform the skill of teamwork.

10.- Do you have good communication between team members?

forever ■ usually ■ rarely

Graphic 32 Represents the answer to question 10 of checklist 2

In the answer to question number 10 of checklist 2 addressed to ICT engineering students, 17 state that they always have good communication with the rest of the team, 13 almost always.

Analyzing the data obtained, it can be identified that this is due to the fact that sometimes some young people work and prefer to do their jobs individually.

To which it can be inferred that, in the future, they must receive seminars on social skills so that they can carry out that competence.

11.- Do you use web resources to do teamwork?

forever ■ usually ■ rarely ■
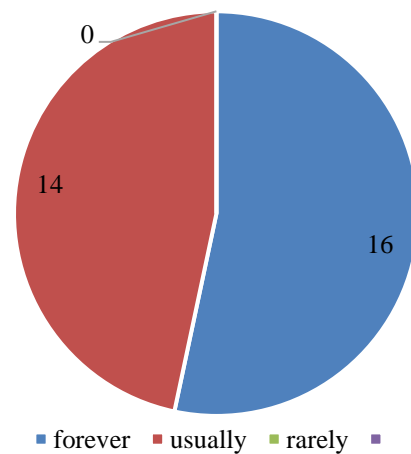
Graphic 33 Represents the answer to question 11 of checklist 2Graph 33. Represents the answer to question 11 of checklist 2

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In the answer to question number 11 of checklist 2 addressed to ICT engineering students, 16 state that, if they use web resources to work, 14 that they do not.

Analyzing the data obtained, it can be identified that this is due to the fact that, as mentioned in the previous answers, some students work and decide to work at their own pace and individually.

To which it can be inferred that in the future they will develop the social skills that the engineering group needs because the majority state that they always use web resources.

12.- Does it propose ideas to improve the work?
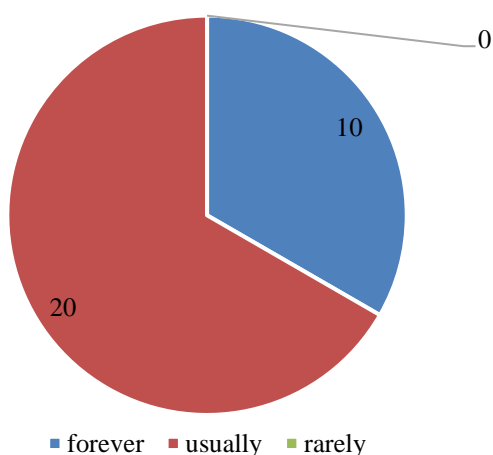
Graphic 34 Represents the answer to question 12 of checklist 2

In the answer to question number 12 of checklist 2 addressed to ICT engineering students, 10 state that they always and 20 almost always come up with ideas to improve the work.

Analyzing the data obtained, it can be identified that, in general, there are always between 7 and 10 students in the ICT group who excel more than the rest of the group and this is a case.

It can be inferred that in the future ideas for improvement should be proposed so that the rest of the group can develop skills and can propose ideas in the work that is developed.

13.- Do you perform your part of the work on time in the agreed terms?
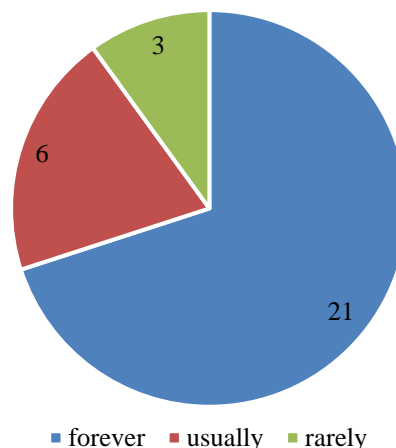
Graphic 35 Represents the answer to question 13 of checklist 2

In the answer to question number 13 of checklist 2 addressed to ICT engineering students, 21 students state that they perform their part of the work on time and 6 almost always.

By analyzing the data obtained, it can be identified that in this group there are students who work from 6 to 10 students who worked this semester.

To which it can be inferred that in the future most of the students will be able to participate on time in the assigned works since the majority manifest it.

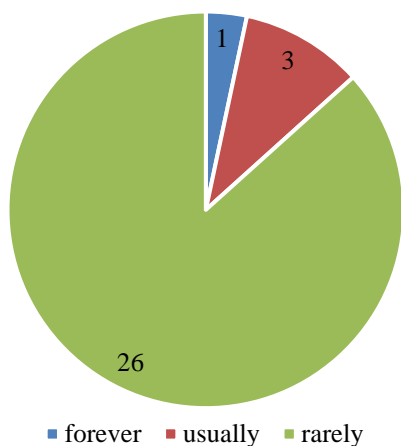14.- Do you perform research projects favorably?
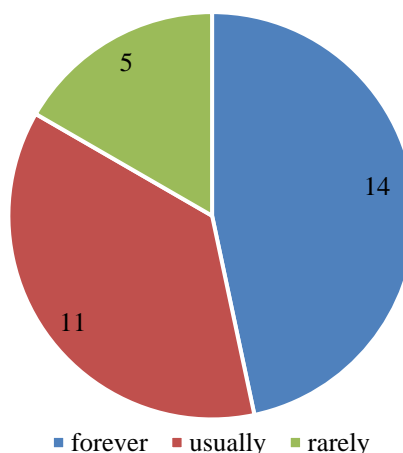
Graphic 36 Represents the answer to question 14 of checklist 2

In the answer to question number 14 of checklist 2 addressed to ICT engineering students, 14 always perform their research project favorably, 11 almost always and 5 students seldom.

Analyzing the data obtained, it can be identified that this indicates that most of the students achieve the objective of research projects.

It can be inferred that in the future all students will participate in such projects.

15.- Do you participate in extracurricular academic activities?

Graphic 37 Represents the answer to question 15 of checklist 2

In the answer to question number 15 of checklist 2 directed to ICT engineering students, 26 students out of 30 stated that they rarely participate in extracurricular events, 3 almost always and 1 always.

Analyzing the data obtained, it can be identified that this is due to the profile of the career, in general they are students who do not participate in these events.

It can be inferred that in the future there should be seminars on administrative and managerial skills so that they can interact and participate more in these events.

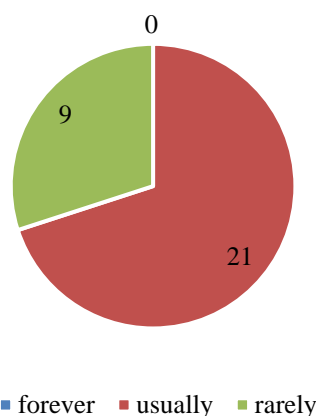16.- Do you perform favorably the activities arranged?
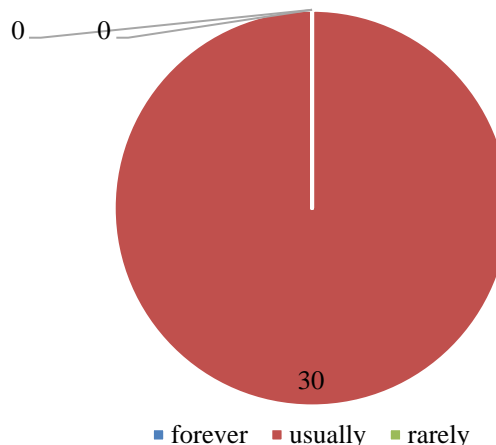
Graphic 38 Represents the answer to question 16 of checklist 2

In the answer to question number 16 of checklist 2 addressed to ICT engineering students, the 30 students state that they almost always comply with what is assigned to them.

By analyzing the data obtained, it can be identified that the students are responsible and comply with what is assigned to them.

To which it can be inferred that in the future it will not be difficult for them to fulfill the assigned activities.

17.- Do you carry out your work with a good level of quality?

Graphic 39 Represents the answer to question 17 of checklist 2

In the answer to question number 17 of checklist 2 addressed to ICT engineering students, 21 students out of 30 state that they do their work with quality and 9 rarely.

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By analyzing the data obtained, it can be identified that this is due to the fact that they meet the requirements that the teacher requests, they comply as far as possible and those who do not fully comply, it is due to external factors such as work or business. personal.

To which it can be inferred that in the future the teacher must design an evaluation instrument where the evaluation criteria are well established with delivery time, methodological specifications and content of the work to be delivered.

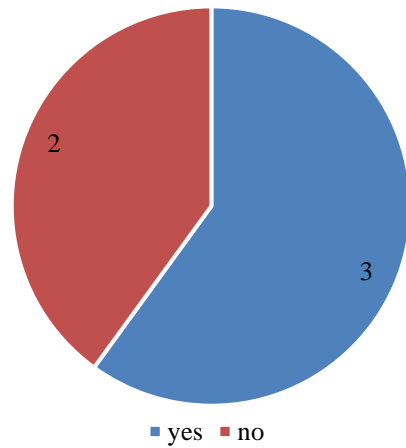**Illustration 45 Checklist 3 Computer Laboratory Technicians**
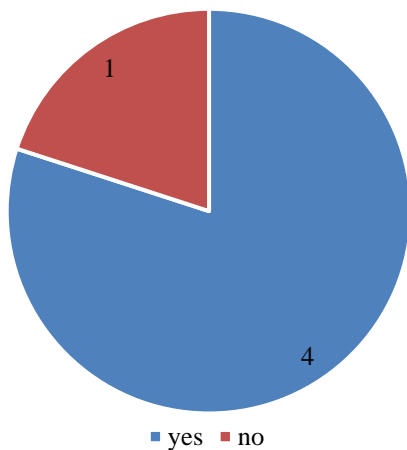
Graphic 40 Represents the answer to question 1 of checklist 3

In the answer to question number 1 of checklist 3 addressed to computer laboratory technicians, they state that 4 laboratories have computer equipment and 1 does not.

By analyzing the data obtained, it can be identified that this is due to the change of electrical wiring that is carried out in a computer laboratory.

To which it can be inferred that in the future there will be 5 laboratories in good condition.
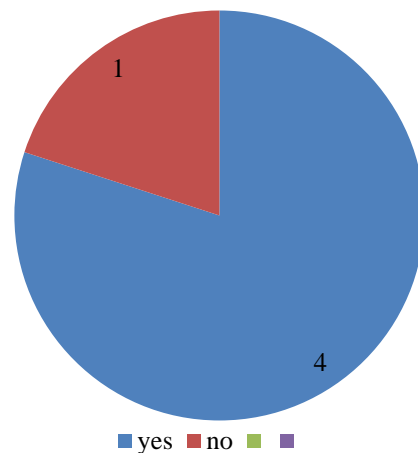
2.- Does it have an image projector?

Graphic 41 Represents the answer to question 2 of checklist 3

In the answer to question number 2 of checklist 3 addressed to computer lab technicians, they state that 3 of 5 computer labs have a projector.

By analyzing the data obtained, it can be identified that 2 projectors are under repair.

From which it can be inferred that in the future there will be 5 computer labs with independent projectors.
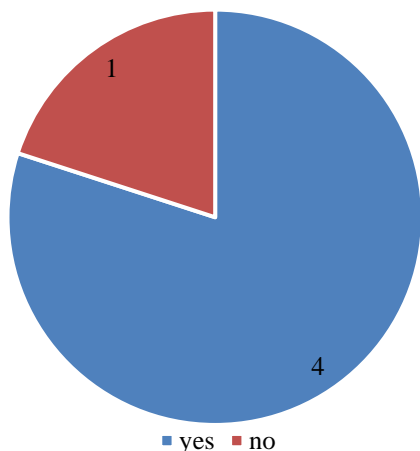
3.- Does it have a digital screen?

Graphic 42 Represents the answer to question 3 of checklist 3

In the answer to question number 3 of checklist 3 addressed to computer lab technicians, they state that 4 labs out of 5 have a digital screen.

By analyzing the data obtained, it was possible to identify that the screen of the fifth laboratory is in the process of being purchased.

VAZQUEZ-MORENO, Erika Ercilia, VAZQUEZ-MORENO, Dolores Guadalupe, PORTELA-PEÑUÑURI, Luis Tadeo and TOLANO-GUTIERREZ, Karina. Virtual environments for the practical training of ICT engineering students: supported by the e-learning modality. Journal Applied Computing. 2022

From which it can be inferred that in the future there will be 5 fully equipped computer labs.
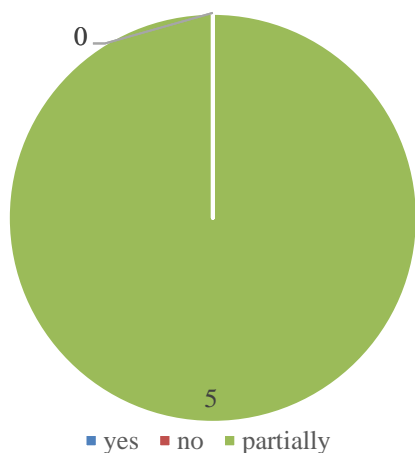
4.- Does it have an audio system?

Graphic 43 Represents the answer to question 4 of checklist 3

In the answer to question number 4 of checklist 3 addressed to computer lab technicians, they state that 4 out of 5 computer labs have an audio system.

By analyzing the data obtained, it can be identified that the installation of the sound system in the fifth laboratory is in process.

From which it can be inferred that in the future there will be 5 fully equipped computer labs.

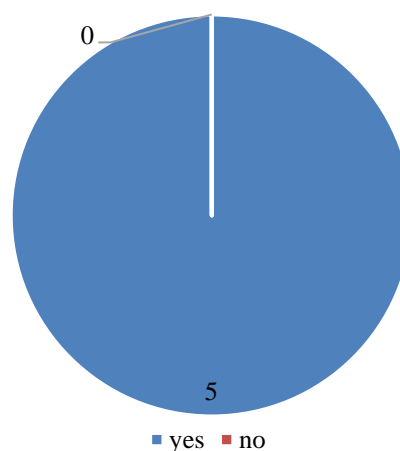5.- Do you carry out research on virtual library databases?

Graphic 44 Represents the answer to question 5 of checklist 3

In the answer to question number 5 of checklist 3 addressed to computer laboratory technicians, they state that they partially use the computer equipment in the laboratories to consult digital libraries from school.

Analyzing the data obtained, it can be identified that young people visit virtual libraries from home or work.

To which it can be inferred that in the future students will develop more skills for managing virtual libraries, without the support of the teacher.
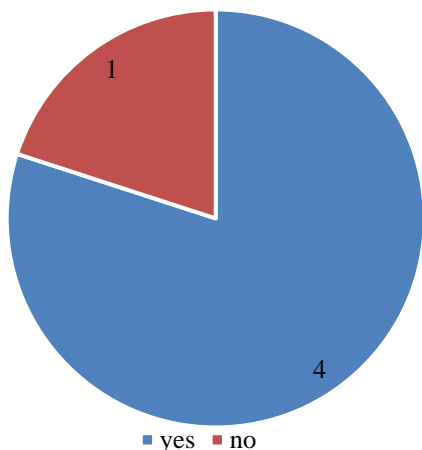
6.- Do you have a wired internet system?

Graphic 45 Represents the answer to question 6 of checklist 3

In the answer to question number 6 of checklist 3 addressed to computer lab technicians, they state that the 5 labs have wired internet.

By analyzing the data obtained, it can be identified that the laboratories have network facilities in good working order for the students. To which it can be inferred that in the future students will be able to take their class without internet connection problems.

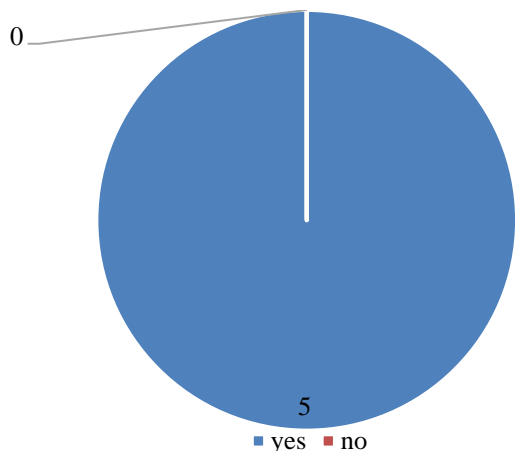7.- Do you have a wireless internet system?

Graphic 46 Represents the answer to question 7 of checklist 3

In the answer to question number 7 of checklist 3 addressed to computer lab technicians, they state that 4 out of 5 computer labs have wireless internet.

By analyzing the data obtained, it was possible to identify that the antennas to provide wireless internet in the fifth laboratory are in the process of being purchased.

From which it can be inferred that in the future there will be 5 fully equipped laboratories.

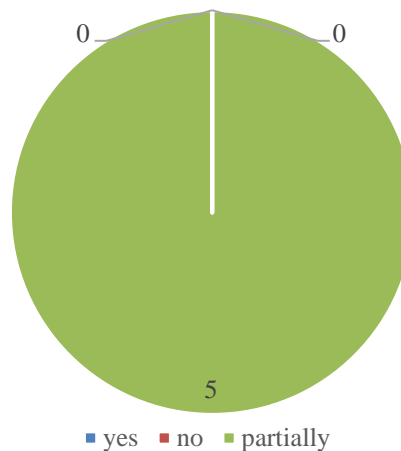8.- Does it have sufficient electrical connections?

Graphic 47 Represents the answer to question 8 of checklist 3

In the answer to question number 8 of the checklist addressed to computer laboratory technicians, they state that the 5 laboratories have sufficient electrical installations.

Analyzing the data obtained, it can be identified that there are connections for laboratory computer equipment and 7 laptops.

To which it can be inferred that in the future, if the equipment installed in the laboratories does not reach and if a student arrives with his laptop, he will be able to connect it and join the class without problem.
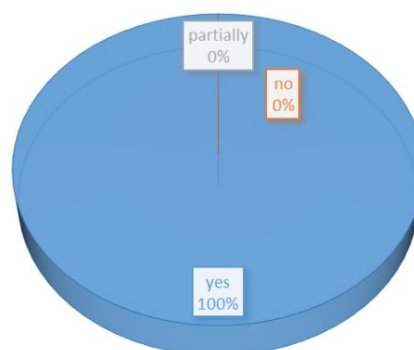
9.- Do you have an online academic management system?

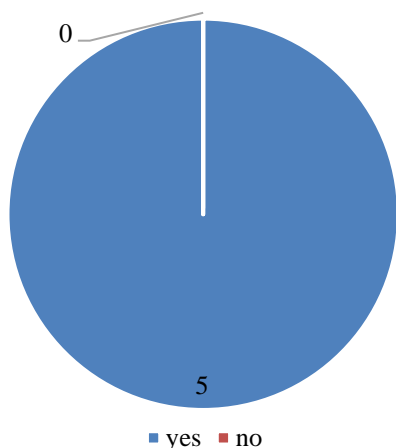**Graphic 48** Represents the answer to question 9 of checklist 3

In the answer to question number 9 of checklist 3 addressed to computer laboratory technicians, they state that academic management is partially carried out in the laboratories.

Analyzing the data obtained, it can be identified that when they access the systems in the laboratories, they access the academic management systems depending on where they have tutoring and advising sessions.

To which it can be inferred that in the future students will be able to access from anywhere once the tutoring systems are outside the school intranet.

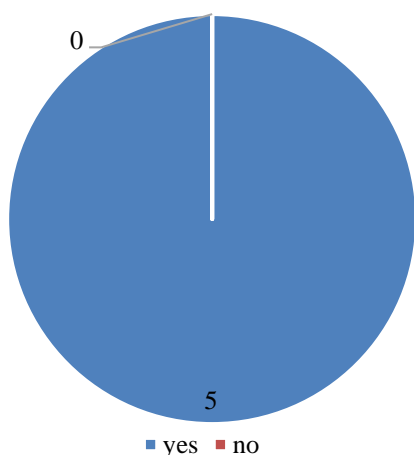10.- Do you have access to the virtual platform?

Graphic 49 Represents the answer to question 10 of checklist 3

In the answer to question number 10 of checklist 3 addressed to computer lab technicians, they state that in the 5 computer labs they can access the virtual platform.

By analyzing the data obtained, it can be identified that access to the virtual platform is already outside the school's intranet since they can access it from their homes or jobs, or mobile devices at all times.

To which it can be inferred that in the future they will be able to be in line with all the processes that are related to the attention of the students.
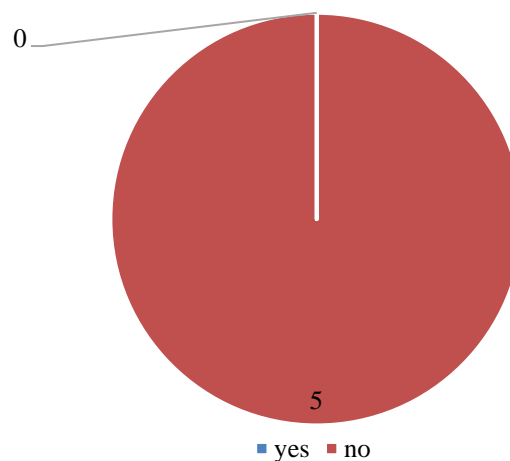
11.- Do you have access to virtual libraries?

Graphic 50 Represents the answer to question 11 of checklist 3

In the answer to question number 11 of checklist 3 addressed to computer lab technicians, they state that they do have access to the 5 labs.

By analyzing the data obtained, it can be identified that, by having access to virtual libraries, students will have more sources of information and will be able to better develop their research work.

To which it can be inferred that in the future B-Learning education can be better developed at UTS.

12.- Do you have an institutional repository to host and consult research?

Graphic 51 Represents the answer to question 12 of checklist 3

In the answer to question number 12 of checklist 3 addressed to computer lab technicians, they state that there are no repositories for student access in any lab.

Analyzing the data obtained, it can be identified that the reference repository is in a library on CD, where the student can have access to it as if it were a physical book, which must be returned after three days of consultation.

To which it can be inferred that in the future there will be an internet portal where all the final works of Higher University Technician and Engineering can be hosted.

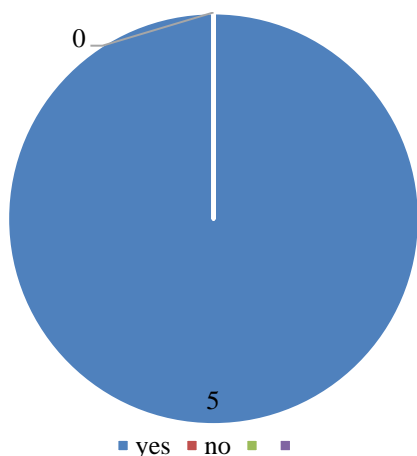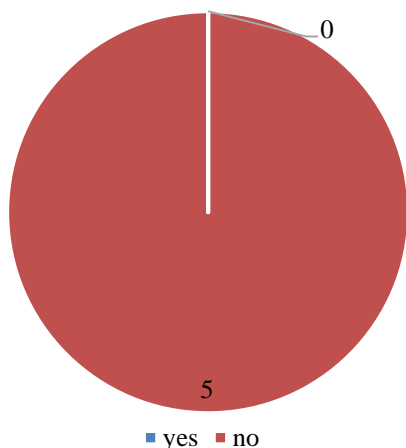13.- Do you have institutional mail for teachers?

yes ■ no ■ ■

Graphic 52 Represents the answer to question 13 of checklist 3

In the answer to question number 13 of checklist 3 addressed to computer lab technicians, they state that in the 5 labs teachers can check institutional mail.

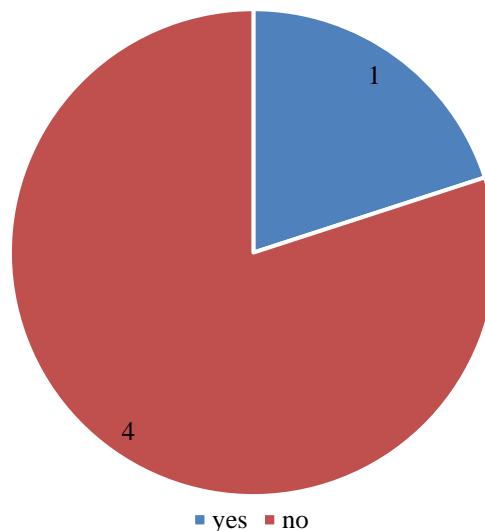14.- Do you have institutional mail for students?

yes ■ no

Graphic 53 Represents the answer to question 14 of checklist 3

In the answer to question number 14 of checklist 3 addressed to computer lab technicians, they state that the students do not have institutional mail.

When analyzing the data obtained, it can be identified that the students do not have institutional mail, but they do have personal mail, which can also be used to communicate with tutors, classmates and teachers.

When making an inference about the future of this questioning, the institutional mail, in his case, would be for group leaders or students who are in research groups with teachers.

15.- Are virtual forums or conferences held to share knowledge?

yes ■ no

Graphic 54 Represents the answer to question 15 of checklist 3

In the answer to question number 15 of checklist 3 addressed to computer lab technicians, they state that virtual conferences are held and when they are held, it is done in a laboratory, because it is larger.

Analyzing the data obtained, it can be identified that virtual conferences can also be held in the rest of the laboratories, which are held on minimal occasions in groups divided in half.

From which it can be inferred that in the future a larger and more spacious audio visual laboratory or classroom can be designed for this type of event so that each user arrives with their laptop and connects if necessary.

16.- Do students have mobile technological resources?
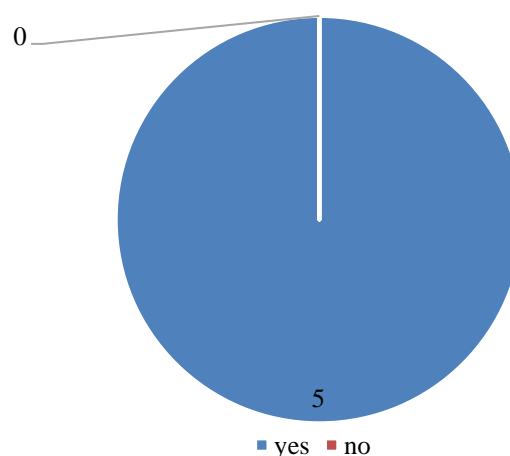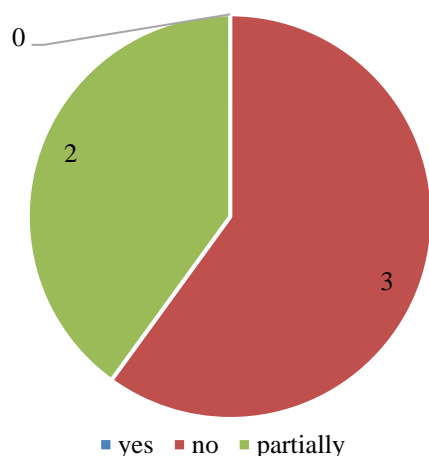

yes ■ no

Graphic 55 Represents the answer to question 16 of checklist 3

In the answer to question number 16 of checklist 3 addressed to computer lab technicians, they state that students can use their devices in the 5 labs.

When analyzing the results obtained, it can be identified that the laboratories have the necessary technology for access and management of technological tools that students can use for their academic development.

To which it can be inferred that in the future their technology use skills will be more developed and they will not have obstacles to comply with what is requested in class.

17.- Is access to web communities (Facebook, WhatsApp, YouTube) free?

■ yes ■ no ■ partially

Graphic 56 Represents the answer to question 17 of checklist 3

In the answer to question number 17 of checklist 3 addressed to computer lab technicians, they state that access to web communities is partially free in 2 labs and definitely not in 3.

Analyzing the data obtained, it can be identified that this is due to the fact that the two laboratories where they are allowed to use it freely are research and homework centers that can be used outside of class, either in recess or free time.

To which it can be inferred that in the future students will have more technological skills for the use of social networks and technological tools to carry out their activities in addition to developing social skills through the network.

Discussion

Observing the results shown in graphs of the surveys applied to the students of the Engineering in Information and Communication Technologies career in the ninth semester, the following diagnosis of the problem studied is determined:

The students consider that the application of web resources is a necessity to support the development of the teaching-learning process. Since 27 of 30 students so declared in the survey (Graphic No. 1).

Between 24 and 27 students state that teachers plan activities for the subject in virtual learning environments, they do so with the Moodle Platform (Graphcis No. 2, 3 and 4).

Almost all teachers include electronic bibliographic references in their Syllabus, which allows access to this information through electronic devices, in addition there is a balance between 20% physical bibliography and 80% electronic bibliography embodied and used in their lesson plans. (Graphics No. 5 and 6).

Only 21 ICT Engineering students use virtual library databases, although currently the UTS does not have this service, they consult external services (Graphic N° 7).

Between 15 and 28 students affirm that teachers plan and develop academic activities in web resources such as blogs, forums, wikis or chat, this being a significant advance in improving synchronous and asynchronous communication between teachers and students. The most used applications for communication and creation of web communities are Facebook and WhatsApp as well as several GoogleApp tools. (Graphics No. 8, 10 and 11).

Online exhibitions are a significant means to teach classes virtually, but unfortunately not one teacher has used this means to socialize content, this being an important resource to be exploited. (Graphic No. 9).

VAZQUEZ-MORENO, Erika Ercilia, VAZQUEZ-MORENO, Dolores Guadalupe, PORTELA-PEÑUÑURI, Luis Tadeo and TOLANO-GUTIERREZ, Karina. Virtual environments for the practical training of ICT engineering students: supported by the e-learning modality. Journal Applied Computing. 2022

21 students affirm that teachers apply the M-Learning methodology (mobile learning) This type of methodology includes mobile resources such as: ipads, pocket computers, mobile phones, tablets, smartphones, in the student learning process. This being a paradigm that is gradually gaining strength among the more traditional teachers. (Graph No. 12).

Another strength found is that both teachers and students in most cases use the data cloud (Cloud Computing) as a support to store and share information and other electronic resources, 30 out of 30 students say so. (Graph No. 13)

An important source of consultation are the institutional repositories, which store the theses of Higher University Technician and Engineering graduates from the UTS, 27 out of 30 ICT engineering students say they consult them. (Graph No. 14).

Currently there are countless applications that facilitate the work of depositing information by applying representative techniques such as surveys in research work, these applications use the web as support, Google drive being the most used due to its free software feature. Between 15 and 21 students affirm that they use it, in addition to the research work carried out by the students, they are published in electronic format on web media such as Blogs or Wikis. (Graph No. 15 and 16).

According to the criteria of 15 students, the technological resources (lap top and tablets) that the UTS makes available for the development of activities are insufficient, which makes it difficult for students to access web resources within the university campus. (Graph No. 17).

The 30 students of the ICT engineering group consider that the Internet service that the University makes available to students is insufficient, which means that it is a criterion that must be improved for the sustainability of online educational processes. (Graph No. 18).

Regarding the methodology used by teachers of virtual subjects, 27 students consider their methodology to be good, this requires a review of the methodology applied by teachers to strengthen educational processes in virtual environments (Graph N° 19).

24 students out of 30 consider the process of accompanying teachers to be good, a fact that the students affirm (Graph N° 20). 21 out of 30 students mention that B-learning is a good practice within their academic training, while 9 consider it unsatisfactory. This indicates that the methodology should be reviewed and the details that the students consider unsatisfactory should be adjusted (Graph N° 21).

As the last indicator of this diagnostic descriptive study, it was asked if they consider that the b-Learning methodology improves their academic performance, a response was obtained that considers that their performance improved significantly, adding 27 students who consider it very significantly, evidencing that students who cross subjects Virtual students acquire certain abilities and skills that optimize their performance in academic activities. (Graph No. 22).

With respect to checklist 2 of students and checklist 3 with respect to laboratory technicians, they respond in almost all of the answers that they know and manage information and communication technologies, with respect to technicians they only mention one laboratory temporarily out of service for technical reasons where they report that it is the change of electrical wiring; which indicates that it is feasible to develop the mixed modality project because students, teachers and technicians have the skills to attend to it, apart from the need on the part of the students who declare it verbally that it would be interesting to start that project that would allow them to work and study in a mixed way.

Conclusions

Studying the results, several aspects to improve for the continuation of the Blended learning methodology are demonstrated, however, we think that all b-learning experiences first go through an adjustment process due to different aspects such as: Technological ignorance, the availability of technological resources Internet connectivity, planning and organization of virtual environments, teacher support, clear evaluation criteria, among others, but by strengthening the diagnosed weaknesses, significant progress can be made in the training of professionals using these new educational scenarios.

These new scenarios of education require us to urgently redefine the methodology, strategies, resources, bibliographic sources and contents of the university curriculum, evolving from traditional models to new models in which the teacher is a mediator in the construction of knowledge, a guide that guides you in the use of digital information and provides you with the appropriate tools in order to strengthen the process of teaching and learning.

The evolution of technologies has made Blended Learning a transversal methodology at the service of education, among the most valuable effects it is evident that they allow greater synchronous and asynchronous communication between students regardless of their culture and geographical location and by breaking space-time barriers brings the University closer to students who, due to personal difficulties, would be unable to stay in a traditional face-to-face modality, offering important possibilities for improvement.

Students who use the Blended Learning methodology achieve important skills such as: search, manipulation, editing, publication and distribution of digital resources in various formats and by different means Likewise, association skills are promoted for cooperative and collaborative work supported by web resources such as social networks, forums, wikis, among others, favoring an amazing dynamic in the generation of new knowledge.

The use of Blended Learning resources significantly improves the means of communication by transversally supporting all the academic and scientific areas of the Universidad Tecnológica del Sur de Sonora, allowing access and integrity of the information resource, as well as optimizing physical resources used in the traditional face-to-face training lastly, we are aware of the role of Higher Education institutions in the gearing of the development plan that requires Universities to see the same horizon in the training of professionals with high performance skills framed in quality; for which, the support in all usable technological resources is formed in an obligation that includes all the actors in this process, approving education as the main path towards competitive, social and human development.

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