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Artículos Científicos

Evaluación de los resultados de implementación del modelo de tutoría virtual

Evaluation of the Results of Implementation of the Virtual Tutoring Model

Avaliação dos resultados da implementação do modelo de tutoria virtual

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Resumen

La tutoría actualmente se ha convertido en un referente importante dentro del modelo de universidades tecnológicas. Esto debido a que se considera una estrategia efectiva para mejorar el proceso de enseñanza-aprendizaje y, por extensión, para disminuir los índices de reprobación y deserción, así como incrementar la eficiencia terminal. En la Universidad Tecnológica de Tecámac (Uttec) el modelo de tutoría virtual se ha desarrollado con el fin de contribuir de manera significativa en el desarrollo de los estudiantes. El objetivo de este estudio fue conocer los resultados de la implementación de dicho modelo, generado mediante estrategias andragógicas y tecnológicas para facilitar la formación profesional en la Ingeniería en Tecnologías de la Información y Comunicación de la Uttec.

En cuanto a los aspectos metodológicos de la investigación, se consideró un enfoque mixto debido a que se combinó tanto la parte cuantitativa como cualitativa. Además, por el dinamismo del proyecto, se utilizó tanto el esquema inductivo como el deductivo. Por otro lado, el diseño de la investigación fue no experimental bajo un método de investigación-acción. Respecto a los resultados de la evaluación obtenidos del pilotaje realizado, más de 65.57 % de los estudiantes que trabajaron el modelo de tutoría virtual están totalmente de acuerdo con los resultados; 28.72 % ni de acuerdo ni en desacuerdo, y 5.71 % no está de acuerdo. Aunado a ello, se obtuvieron en la parte cualitativa retroalimentaciones importantes para realizar mejoras en el proyecto, con lo cual se podrá elevar el índice de satisfacción.

Palabras clave: ambiente de aprendizaje, modelo de tutoría virtual, investigación-acción.

Abstract

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Currently, tutoring has become an important reference in the model of technological universities. This is due to the fact that it is considered as an effective strategy to improve the teaching-learning process and, by extension, to decrease the failure and dropout rates, as well as increase the efficiency terminal. At the Universidad Tecnológica de Tecámac (Uttec), the virtual tutoring project has been developed in order to contribute significantly to the improvement of students. The objective of this study was to know the results of implementation of the aforementioned project, generated by andragogic and technological strategies to facilitate professional training in Engineering in Information and Communication Technologies of the Uttec.

Regarding the methodological aspects of the research, a mixed approach was considered, since both the quantitative and qualitative aspects will be combined. Also, due to the dynamism of the project, both the inductive and the deductive schemes were used. On the other hand, the design of the research was non-experimental under an action-research method. Regarding the results of the evaluation obtained from the piloting carried out, more than 65% of the students who worked on the virtual tutoring model are totally in agreement with the results; 33% neither in agreement nor in disagreement, and 3% are not in agreement. In addition, important feedback was obtained in the qualitative part to make improvements in the project, which will increase the satisfaction index.

Keywords: learning environment, model virtual tutoring, research-action.

Resumo

A tutoria tornou-se agora uma referência importante dentro do modelo de universidades tecnológicas. Isso ocorre porque é considerada uma estratégia eficaz para melhorar o processo de ensino-aprendizagem e, por extensão, diminuir as taxas de reprovação e abandono, além de aumentar a eficiência do terminal. Na Universidade Tecnológica de Tecámac (Uttec), o modelo de tutoria virtual foi desenvolvido para contribuir significativamente para o desenvolvimento dos alunos. O objetivo deste estudo foi conhecer os resultados da implementação deste modelo, gerado por meio de estratégias andróginas e tecnológicas para facilitar a formação profissional em Engenharia de Tecnologias da Informação e Comunicação da Uttec.

Em relação aos aspectos metodológicos da investigação, considerou-se uma abordagem mista, pois a parte quantitativa e a qualitativa foram combinadas. Além disso, devido ao dinamismo do

projeto, foram utilizados o esquema indutivo e o dedutivo. Por outro lado, o desenho da pesquisa não foi experimental sob um método de pesquisa-ação. Em relação aos resultados da avaliação obtida na pilotagem, mais de 65,57% dos alunos que trabalharam no modelo de tutoria virtual concordam plenamente com os resultados; 28,72% não concordam nem discordam e 5,71% discordam. Além disso, foram obtidas qualificações importantes na parte qualitativa para melhorias no projeto, com as quais a taxa de satisfação pode ser aumentada.

Palavras-chave: ambiente de aprendizagem, modelo de tutoria virtual, pesquisa-ação.

Fecha Recepción: Febrero 2019 **Fecha Aceptación:** Septiembre 2019

Introduction

The Technological University of Tecámac (Uttec) is a decentralized public body of the Government of the State of Mexico. It was created in 1996 with the aim of training university senior technicians and engineers capable of applying knowledge aimed at the creative solution of problems in the productive sector and the requirements of the economic and social development of the state and the country.

In this institution there are eleven educational programs of university technician and eight degree level. And it has an enrollment of more than 6000 students. It is worth mentioning that, of the total, about 70% study at level 5A, educational programs recognized nationally for their good quality. Scientific activities are carried out in its different classrooms, laboratories and workshops.

When the pilot of the virtual tutoring project began in the Engineering in Information and Communication Technologies, in the four-month period May-August 2018, there were 654 students enrolled: 269 university senior technicians (from 1 to 5 .Th semester) and 218 engineering (from 7th to 10th semester). It is worth mentioning that this project is currently oriented only to engineering students, namely: from 7th to 10th semester, since in the 6th and 11th semester they are in a company or institution doing Your professional stay

Figueroa (2009) mentions that, within the context of technological universities, tutoring responds to an inherent characteristic as part of the services of accompaniment to the student, with respect to its insertion, adaptation and journey of his university life.

The Uttec, always concerned with continuous improvement, has implemented a face-to-face tutoring model. However, due to the current needs of the students, specifically of the Engineering in Information and Communication Technologies, it is necessary to look for an

alternative scheme that allows the students to be able to carry out this work without implying a greater load in their schedules, in a flexible way, and that allows to strengthen their professional training.

Given the circumstances that were being presented with the students of that career, the virtual tutoring project emerges as a tactic to follow up the students and as an effective means of communication between the tutor and his tutors. To create this proposal, we worked with an interdisciplinary group of experts that defined the virtual tutoring model according to the main problems detected in engineering, defining the objectives that are intended to be achieved in each four-month period, and, based on this, perform both the instructional design as materials.

On the other hand, it was proposed that, through the virtual environment, the tutors be monitored in order to improve their practice, and find the areas of opportunity that are available for the tutoring to really be effective.

This article describes the evaluation of the results of the aforementioned model, which has both technological and androgynous foundations, for which a broad research and intervention proposal was carried out that will allow Uttec to have a tutorial alternative under a new, effective approach. and with a positive impact among engineering students, taking advantage of course the use of information and communication technologies (ICT).

Objective

To know the results of the implementation of the virtual tutoring model generated through andragogical and technological strategies to strengthen professional training in Information Technology and Communication Engineering at Uttec.

Research question

How to evaluate the implementation of the virtual tutoring model for the strengthening of professional training in Engineering in Information and Communication Technologies of the Uttec?

Hypothesis

The implementation of a virtual tutoring model for students of Engineering in Information and Communication Technologies will strengthen their professional training.

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State of the art

Learning theories and tutorial action were an important reference during the research process of this project. The cognitive theory of Ausubel (1976), for example, states that the teaching-learning process must be carried out in a creative and innovative environment. With this orientation, the interest lies in promoting the development of cognitive and creative processes, so that, later, the student develops with autonomy and independence in their professional practice, with their own innovations (self-managed learning).

Learning to learn is key to the tutorial action, and takes on special importance in addressing the development of skills. In that plane, learning is conceived as the student's link between knowledge and previous experiences (Gairín, 2014). On the other hand, and returning to this perspective the conception of learning, it is understood that this is the active process of processing and construction through which the individual acquires practical skills or abilities, as well as incorporates informative content, or adopts new knowledge strategies or action, values and attitudes; In addition, it is in this adoption that it is verified that the learning has actually occurred (Pozo, 2009).

In the tutorial action, the tutor promotes students' abilities to process information; and this constitutes a fundamental factor for the development of comprehension, learning and retention skills. When considering that the student is an active subject, their processes are emphasized in the processing skills that they display about the learning situation; and it moves more and more away from the position that conceives the student as a passive receiver of the information. So that this, the apprentice, becomes the center of attention of the tutor, and great importance is attached to the analysis of all those activities in which he engages, in order to acquire, select, remember, organize and integrate knowledge. Students, when they receive new information, process it, store it and then retrieve it to apply it to new learning situations (Marroquín y Forzante, s. F.).

Likewise, the student develops a learning that facilitates him to execute more complex mental activities, such as those involved in the use of cognitive strategies in the acquisition of knowledge, in the solution of problems and in the processes of self-regulation. If the tutor promotes and facilitates in his students the mastery of learning strategies, he can plan and organize his own activities, which can be techniques or habits, and other strategies for his development (Rivas, 2000).

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However, several authors have defined the concept of virtual tutoring. However, many of them see tutoring rather as academic advice. The concept that is closest to what has been implemented in the Uttec is the following:

> Virtual tutoring is key in the teaching-learning processes of the distance modality, it arises in a space of communicative didactic exchange between students, teachers and tutors that is the virtual platform, which in turn, allows us to present a practical context and cooperative, provide information to our students and colleagues teachers-tutors, harmonize the classical and virtual media, facilitate the development of training tasks, generate a learning community, develop a tutorial function according to the environment (Medina, Domínguez y Sánchez, 2011, p. 15).

Another important reference for this work was the andralogical part, since the students of Engineering in Information and Communication Technologies are adults. Bernard (1985, p.4) sees andragogy as follows:

> A discipline defined at the same time as a science and an art; a science that deals with the historical, philosophical, sociological, psychological and organizational aspects of adult education; an art exerted in a social practice that is evident thanks to all the educational activities organized especially for the adult.

Methodology

The present investigation had a mixed approach because both the quantitative and qualitative approach were combined. In addition, due to the dynamism of the project, the research uses both the inductive and the deductive scheme.

The research design was non-experimental, as there is no management and modification of research variables. What is done in non-experimental research is to observe phenomena as they occur in their natural context and then analyze them. As Kerlinger (1979; cited in Ávila, 2006) points out: “Non-experimental or ex-professed research is any investigation in which it is impossible to manipulate variables or randomly assign subjects or conditions” (p. 76).

For the development of this project, it was decided to carry out an exploratory study, since, according to Hernández, Fernández and Baptista (2010): “Exploratory studies are carried out when

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the objective is to examine a topic or research problem little studied, of which have many doubts, or has not been addressed before ”(p. 79).

Derived from the review of the literature that was done, it was observed that there is very little material written around virtual tutoring, as this is confused with the term advice. Therefore, being a little studied topic, it was decided to do an exploratory investigation.

The method chosen for this research project is action research, a methodology in which tutors are the protagonists of their own knowledge construction process, and that allows the detection of problems and needs and the elaboration of proposals and solutions There are many advantages to action research:

- The identification of the social forces and the relationships that are behind the human experience.
- The generation of new knowledge to the researcher, and to the groups involved.
- Mobilization and strengthening of grassroots organizations.
- The optimization of the use of available resources based on the critical analysis of needs and change options.
- In some cases, after checking the results in reality, it is possible to start a new cycle.

This type of research was developed here following a spiral model in successive cycles (Bisquerra, 2004). Its main phases are shown in figure 1.

Figura 1. Fases de la investigación-acción

Fuente: Elaboración propia con base en Bisquerra (2004)

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1) Problematization: At this stage the data were sorted, grouped and related according to the objectives of the investigation, preparing the information in order to proceed with its analysis and interpretation, which allowed to know the current situation of the tutoring and with it Be able to make a diagnosis.

2) 2) Diagnosis: Once the problem was identified, and having formulated its statement, the information was collected. This consisted of collecting various evidences, through different data collection techniques, and knowing the point of view of the actors involved, in this case in the mentoring process.

3) For the above, instruments were designed that were used to collect and store information, such as questionnaires and interviews, the matrix of strengths, opportunities, weaknesses and threats (SWOT) and documentary review.

4) 3) Design of a proposal for change: In this phase the various alternatives of action and their possible consequences were considered. A prospective reflection was made that allowed to design a proposal for change and improvement, and to define an evaluation design for it. This was done with the intention of anticipating the indicators and goals that were defined in the proposal.

5) 4) Application of proposal: After designing the action proposal of the virtual mentoring model, which was carried out by interested persons, the proposal made was applied, which implied a new way of acting, an innovation and improvement effort of teaching practice, which, according to the method, must be permanently subjected to conditions of analysis, evaluation and reflection.

6) 5) Evaluation: At the end of the research process, the evaluation was carried out, from which a feedback was obtained to improve the project and thereby make the changes that are required in order to improve it. It will be the new situation and its consequences that determine the research process; and the probable start of another cycle in the spiral of action research.

Population and sample

The population contemplated for the evaluation were only the 218 students of Engineering in Information and Communication Technologies enrolled in 7th, 8th, 9th and 10th semester during the period May-August 2018.

To obtain part of the results of the implementation of the virtual tutoring model, and in order to identify the areas of opportunity that the students of said career have in relation to the tutoring, a survey was conducted through the application of questionnaires.

With the intention of generalizing the results obtained to the entire population, the sample was carried out in a representative manner. For this, the first step was to determine the sample size. This depends on three aspects:

1) Error allowed.

2) Estimated confidence level.

3) Finite or infinite character of the population.

In this case, as already mentioned, the population is made up of 218 students, so it is a finite population (less than 100,000). Knowing the above, the following formula applies:

$$n = \frac{Z^2 * N * p * q}{E^2 (N-1) + Z^2 * p * q}$$

As:

n = Number of sample items.

N = Number of elements of the population or universe. In this case: 218.

p / *q* = Probabilities with which the phenomenon occurs. In the present study the most appropriate case was taken, that is, the one that needs the maximum sample size, which occurs to *p* = *q* = 50, luego *p* = 50 y *q* = 50.

Z = Critical value corresponding to the level of confidence chosen. A 95% confidence level is desired here, which corresponds to a Z value of 1.96.

E = Error margin allowed. In this case it was decided to take a margin of error of 5%.

So, replacing the above, you have:

$$n = \frac{(1.96)^2 * 218 * .50 * .50}{.05^2 * (218-1) + (1.96^2) * .50 * .50}$$

$$n = \frac{209.3672}{1.5028} = 139.31$$

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$$n = 139$$

The second step is the sample selection process, which is based on the principle of randomization in order to give the survey reliability. The sampling that was used in the present investigation is random since it is based on chance and is characterized in that all the elements always have the same probability of being chosen. Even more: due to the nature of the investigation, stratified random sampling was used.

In this case, the stratification was done by educational program, and in turn, by four-month period, thanks to what is guaranteed that the sample has the same composition as the population. Table 1 shows the enrollment integration at the beginning of the May-August 2018 semester.

Tabla 1. Integración de la matrícula al inicio del cuatrimestre

Matrícula cuatrimestre mayo-agosto 2018					
Núm.	**Grupo**	**H**	**M**	**Total**	**Total por cuatrimestre**
1	7ITI1	29	9	38	38
2	8ITI1	30	6	36	70
3	8ITI2	26	8	34	
4	9ITI1	16	6	22	74
5	9ITI2	19	7	26	
6	9ITI3	18	8	26	
7	11ITI1	20	16	36	36
Totales		**158**	**60**	**218**	**218**

Fuente: Elaboración Propia

Based on the sample size determined (139 questionnaires) and considering the previous percentages, the percentage and the samples were determined per semester. The results are presented in table 2.

Tabla 2. Porcentaje y número de cuestionarios a aplicar por cuatrimestre.

Carrera	**Séptimo**	**Octavo**	**Noveno**	**Décimo**	**TOTAL**

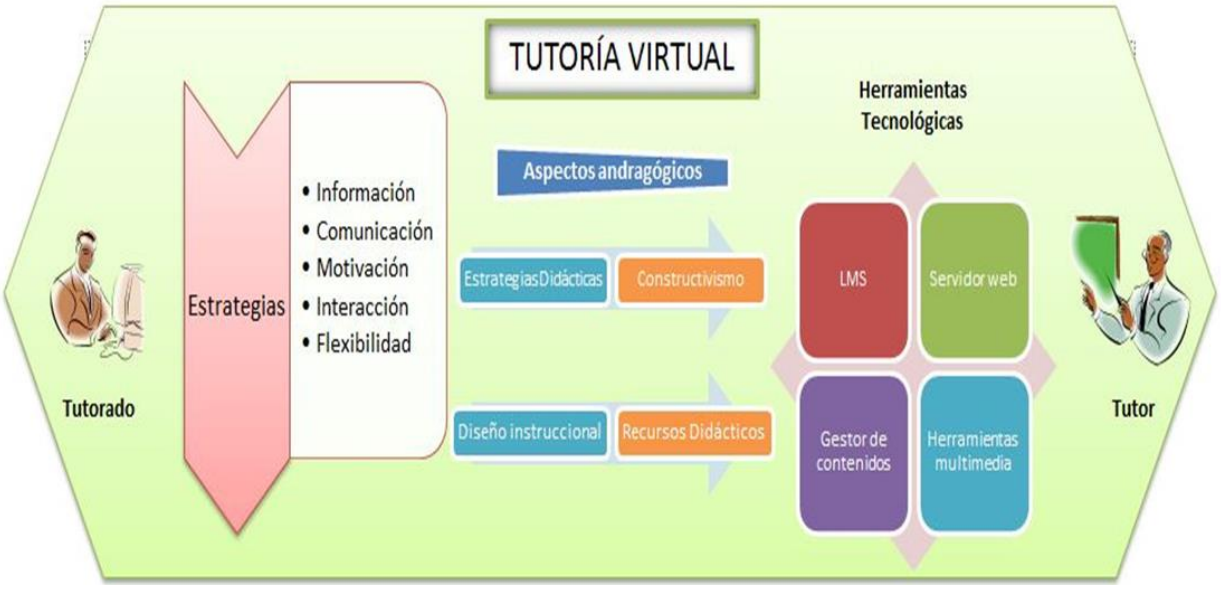
Porcentaje de matrícula de la Ingeniería en Tecnologías de la Información y de la Comunicación	17 %	32 %	34 %	17 %	**100%**
Número de cuestionarios a aplicar	24	44	47	24	**139**

Fuente: Elaboración propia

Virtual Tutoring Model

The proposal of a virtual tutoring model was designed mainly considering the characteristics and needs of the students of the engineering already specified. Figure 2 shows this model.

Figura 2. Modelo de tutoría virtual



Fuente: Elaboración Propia

As part of the important results, there is the detection of training needs, which were obtained based on the data provided by the instruments applied. From these the contents were defined for each of the tutorials. The goals were to generate virtual tutoring for the following four-

month periods: 7th, 8th, 9th and 10th, with the objective of covering all engineering students. It is important to mention once again that the 11th semester was not considered because the students in this semester are staying.

A general theme was defined by semester, the objective of the tutoring of each semester, and the number of sessions, which remained in 12, because although the semester has 15 weeks, the last two are for evaluation, together with what was considered Start from the second week. Thus, it was considered to start in the second and end two weeks before closing for all cases.

Each tutoring session is designed to work one hour a week. And the student has the opportunity to work it when it is most convenient, which makes the tutorial model more flexible. The tutorials were organized as shown in table 3.

Tabla 3. Estructura general de la tutoría virtual

Cuatrimestre	**Temática**	**Objetivo**	**Número de sesiones**
7.º	Herramientas básicas	Reflexionar sobre la importancia de la tutoría virtual como una herramienta introductoria a la ingeniería, y conocer las habilidades con que cuenta el estudiante para enfrentarse a ella.	12
8.º	Habilidades del pensamiento	Desarrollar las habilidades del pensamiento del estudiante a través de ejercicios que impacten de manera positiva su desempeño escolar.	12
9.º	Imagen de sí mismo	Desarrollar una imagen positiva de sí mismo, que contribuya a un mejor desempeño como profesional.	12
10.º	Habilidades para el éxito	Desarrollar las habilidades necesarias que favorezcan su formación como profesional competitivo.	12

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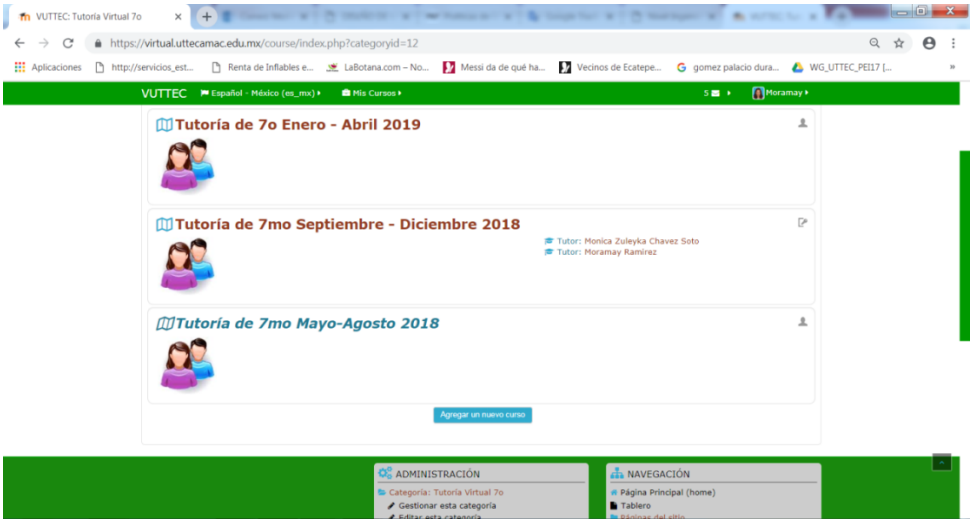
Fuente: Elaboración propia

From the above, the model and contents were implemented in the Uttec virtual platform, as shown in figure 3.

Figura 3. Sitio de tutoría virtual



Fuente: Elaboración propia

For the evaluation of the results of the implementation of the virtual tutoring model, 3 instruments were applied. The first instrument was applied to the members of the Academic Body of Tutoring. The second instrument to tutored students. And the last one was a review of statistical data.

Instrument 1. Evaluation of the continuous process

For the evaluation part of the process the guide of questions of Cookson (2003) was taken into account. This was answered by the five experts of the Academic Body of Tutoring (see table 4).

Tabla 4. Dimensiones de la evaluación del proceso continuo

Etapa	Dimensiones	Núm. de ítems
Diagnóstico	Valoración del ambiente	2
	Contenido propuesto	1
Diseño	Plan y proceso	2
	Cumplimiento de objetivos	2
	Materiales y herramientas	3
Aplicación de la propuesta	Ambiente de aprendizaje	2
	Eficacia de los recursos	3
Evaluación	Diseño instruccional	3

Fuente: Elaboración propia

All questions are dichotomous: it is specified only if the question is fulfilled or not.

Instrument 2. Evaluation of virtual tutoring

This instrument was designed to evaluate the pilot implementation of the virtual tutoring model by the tutored students of Engineering in Information and Communication Technologies, who took this modality.

The questions were evaluated according to the following scale:

1. Totally agree.
2. Neither agree nor disagree.
3. Strongly disagree.

Participants were asked the number they considered best reflected their opinion. Table 5 shows the dimensions and questions of the instrument.

Tabla 5. Dimensiones de la evaluación del proceso continuo

Núm. de dimensión	Dimensiones	Núm. de ítems
1	Plataforma	2
2	Modalidad virtual	3
3	Contenidos	4
4	Desempeño de tu tutor	9
5	Programa de tutoría	3

Fuente: Elaboración Propia

To complement, four open questions were asked, focusing on suggestions, improvements and general comments.

Instrument 3. Data review

The review of written sources that are closely related to the purpose of the study was very important for the project. For the present investigation, data processing is an activity that involves a set of manipulations, transformations, reflections and checks from the data collected in order to extract relevant meanings for the study.

The Uttec has an automated system where the statistical information of the students is concentrated. From there, the data that were considered important for deductive reasoning of the results of the project application were taken, considering approval, disapproval, averages and school dropout, taking as reference the periods from the diagnosis was made until it was piloted.

Results

Analysis of the instrument 1. Evaluation of the continuous process

As already mentioned, this instrument was applied to five members of the Academic Body of Tutoring. The results presented in table 6 were obtained.

Tabla 6. Resultados de la evaluación del proceso continuo

Etapa	Dimensiones	Núm. de ítems	Sí	No
Diagnóstico	Valoración del ambiente	2	9	1
	Contenido propuesto	1	5	0
Diseño	Plan y proceso	2	8	2
	Cumplimiento de objetivos	2	9	1
	Materiales y herramientas	3	12	3
Aplicación de la propuesta	Ambiente de aprendizaje	2	9	1
	Eficacia de los recursos	3	12	3
Evaluación	Diseño instruccional	3	13	2
		Total	77	13
		%	85.5 %	14.5 %

Fuente: Elaboración propia

As can be seen, most of the results are positive, since it is met at 85.5%. However, there are areas of opportunity to improve, such as the dimensions of Materials and tools and Resource efficiency.

Analysis of the instrument 2. Evaluation of virtual tutoring

As mentioned above, the piloting of this project was carried out in the four-month period May-August 2018, with students from 7th, 8th, 9th and 10th semesters of the Engineering in Technologies Information and Communication, with the intention of providing feedback on the results and improving the model.

The survey was applied to 139 students who took virtual tutoring. Table 7 shows the results of the surveys applied.

Tabla 7. Resultados de la evaluación de los estudiantes

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Núm.	Pregunta	Totalmente de acuerdo (%)	Ni de acuerdo ni en desacuerdo (%)	Totalmente en desacuerdo (%)
1	¿La modalidad de tutoría virtual te pareció adecuada para para tu formación profesional?	76 %	22 %	3 %
2	¿El uso de la plataforma fue sencillo?	54 %	43 %	3 %
3	¿El diseño de la plataforma es atractivo?	62 %	19 %	19 %
4	¿Realizaste algunas de las actividades semanales?	70 %	27 %	3 %
5	¿La velocidad para consultar la plataforma y resolver los ejercicios es adecuada?	32 %	46 %	22 %
6	¿Los contenidos te fueron interesantes para tu desempeño académico?	62 %	35 %	3 %
7	¿Aplicaste algo de lo visto en la tutoría virtual en tu vida diaria?	51 %	46 %	3 %
8	¿Los ejercicios aplicados en tutoría virtual los consideras adecuados para mejorar tu desempeño académico?	70 %	14 %	16 %
9	¿Las instrucciones para realizar las actividades te resultaron claras?	65 %	27 %	8 %
10	¿Mostró buena disposición para apoyarte?	76 %	22 %	3 %
11	¿Mostró interés en tu desempeño académico?	76 %	22 %	3 %
12	¿Te motivó a utilizar el esquema virtual de tutorías?	78 %	19 %	3 %
13	¿Te apoyó para identificar tus dificultades académicas?	59 %	38 %	3 %
14	¿Existió un canal de comunicación adecuado entre tu tutor y tú?	78 %	19 %	3 %
15	¿Respondió tus dudas de manera clara y rápida?	76 %	22 %	3 %
16	¿Fue sencillo localizar a tu tutor de manera presencial?	73 %	24 %	3 %
17	¿Te brindó información oportuna hacia algún servicio de apoyo (servicio médico, servicios estudiantiles, extensión universitaria, otro)? Solo responde si requeriste alguna canalización.	70 %	24 %	5 %
18	¿Te canalizó oportunamente a alguno de los servicio de apoyo (servicio médico, servicios estudiantiles, extensión universitaria, otro)? Solo responde si requeriste la canalización.	73 %	22 %	5 %

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19	¿Tu participación en el programa de tutoría virtual ha mejorado tu desempeño académico?	46 %	51 %	3 %
20	¿Consideras que la tutoría favorece tu formación personal y profesional?	70 %	27 %	3 %
21	¿Tu integración a la universidad ha mejorado con el programa de tutoría virtual?	62 %	35 %	3 %
	%	**65.57 %**	**28.72 %**	**5.71 %**

Fuente: Elaboración propia

As you can see, 65.57% of the tutored students who participated in the pilot of the virtual tutoring platform in the four-month period May-August 2018 fully agree with this modality; 28.72% neither agree nor disagree, and 5.71% strongly disagree. Therefore, based on the results, it was reviewed and identified that the areas with the greatest opportunity are the following:

- The speed of the platform. In this sense, the institution will work to improve the bandwidth of the service, but it also depends on the speed students have in their homes.
- Academic performance. Update the sessions to have a greater impact and improve academic performance, relating them to subjects with less academic achievement.
- Academic difficulties. Include more activities that help tutors clearly identify their academic needs
- Continuous improvement of virtual tutoring. In addition to the above, efforts will be made to improve the results of this first evaluation, especially by motivating tutors to perform their work better and periodically updating the platform.

It should be noted that the results of question 20 regarding the strengthening of personal and professional training: 70% totally agree that they are strengthening.

Regarding the contributions made of the four open questions, they will be analyzed together with the academic body of tutorials and the suggestions that are relevant for the next work update will be considered. Table 8 shows the list of comments.

Tabla 8. Comentarios por parte de los estudiantes

Categoría	Pregunta	Comentarios
Diseño y usabilidad	Si se considerara algún cambio al diseño y	• Agregar más temas. • En algunas actividades, ampliar el tamaño de la letra. • La conexión es un poco lenta y se traba en ocasiones. • Solo me gustaría que mejoraran el método de evaluación de respuestas en las actividades de la plataforma, pues, aunque a

	manejo de la plataforma de tutoría virtual, ¿cuál (es) sería (n)?	veces nuestra respuesta sea correcta, si la escribimos diferente la toma como incorrecta. • Que se tardaran menos los videos en visualizarse y el diseño del perfil. • Velocidad en los gráficos y las ventanas e instrucciones más claras. • Ninguno, considero que el diseño es apropiado y tiene buena vista. • El diseño está muy bueno. • Esta agradable. • Ninguna. Me parece perfecta la plataforma. Solo en cuestión de los *play*, que por la conectividad tardan en cargar. • No, el diseño es el correcto. • Buen diseño y no está sobrecargado. • Pues solo que se haga bien hincapié sobre la nueva plataforma. • No cambiaría nada. En mi caso me pareció muy bien. • Sin comentarios. • Ninguno. • Que sea un poco más interesante. • El diseño me gustó mucho, muy didácticos los personajes. • Ninguno, ya que tiene un diseño atractivo. • Que las actividades se realizan en una solo ventana, que los tiempos de término de la actividad los marque bien y que el chat esté más a la vista del usuario. • Evitar emerger demasiadas ventanitas en las actividades. • Que el cambio se haga para agilizar la plataforma. • El diseño es perfecto.
Contenido	¿Qué sugerencias harías para mejorar el contenido del programa de tutoría virtual?	• Más actividades interactivas. • Que pongan más sencilla la ruta de las actividades. • Mejorar el diseño de la página. • Mejorar la velocidad cuando cargan las sesiones o actividades. • Ninguna. • El contenido es útil. • Ninguno. Los temas que se aportan son los adecuados. • Nada. • Más imágenes, menos lectura en algunas diapositivas. • No forzar la entrega de las actividades. • Más temas o artículos de acuerdo con la carrera. • Los temas me ayudaron en otras materias. • Que añadan más temas. Son buenos los que contiene pero aún falta información. • Sin comentarios.

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		• Que no sea tanta teoría. • Los temas son buenos. • Cuando terminemos algún ejercicio, que el programa lo marque como resuelto, y nos redireccione a los que nos falta por resolver. • Me gustaron los temas son atractivos y útiles para nosotros. • En el contenido, a mi parecer no hay que realizarle gran modificación, ya que los temas son atractivos.
Interés	¿Qué temas serían de tu interés para tratar en tutoría virtual?	• Realizar actividades de desempeño. • Más del tema de la toma de decisiones. • Agregar más videos o audios para hacer más amenas las actividades. • Los temas que ya se manejan me parecen adecuados y acordes a nuestro nivel académico. • La responsabilidad. • Están completos. • Menos lectura y más actividades de memoria o más interactivas. • En general, creo que tocan varios temas importantes. • Autoestima. • Liderazgo, autoestima, equipos de trabajo. • Los que contiene son buenos. • Pues está bien solo que nos tenemos que acostumbrar a la plataforma y a las actividades. • Temas enfocados a entrevistas de trabajo y sobre el currículum *vitae*. • Sin comentarios. • Ninguna. • Habilidades y aptitudes. • Adaptación escolar y familiar. • Acerca de las oportunidades de trabajo al egresar, apariencia profesional, etc. • En mi opinión, los temas que se manejan son los adecuados con tutoría, no cambiaría ni agregaría ningún tema. • Violencia, inteligencia emocional. • El saber cómo vendernos ante la sociedad, cómo vender nuestros servicios. Ese tema para mí sería el mejor que se podría tratar en la tutoría. • Más iconos que palabras, hacen que la página sea más fácil de entender. • Trabajo en equipo. • Que también tomen algo sobre la manera de ser de los alumnos. • Desarrollo de equipos de trabajo.

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General	Comentario general	• Me pareció buena la tutoría en esta plataforma aula virtual. • Es muy buena plataforma pero necesitan corregir pequeños detalles. • En general fue divertido, informativo e interesante trabajar en la plataforma. • Me fue útil hacer uso de las actividades de esta plataforma. • Los temas relacionados con el sistema de tutorías están muy buenos, las actividades son muy interactivas y comprensibles. En cuanto al diseño, es muy bueno. • Es una plataforma que tiene muy buen contenido. • Pues la plataforma está bien, pero la verdad hay veces que no me acuerdo que tengo que ingresar a la plataforma para realizar las actividades. Y la tutora es muy buena, ya que nos brindó mucha confianza y cuando he necesitado ayuda, con mucho gusto nos brinda la ayuda. Y tiene la capacidad de transmitir sus conocimientos. • Me pareció una excelente herramienta. • En general, es de mucha utilidad el realizar tutoría desde cualquier lado, evitando tomar las clases. Aparte de que tiene muchos gráficos y material que ayudan a interactuar con la plataforma. • Muy buena plataforma. • Aumentar un poco más las instrucciones. • Algunas actividades presentan problemas en los vínculos. • Solo hay que mejorar un poco la carga de los archivos o ejercicios. • Es amigable la plataforma. • Esto me puede ayudar en mi carrera. Los felicito. • Sin comentarios. • Servicios médicos. • Mucha información de la que me brindaron me ayudó a confirmar mis objetivos y la forma de alcanzarlos. • Es una buena plataforma ya que se encuentra aún en desarrollo. • Me pareció bueno el programa de tutoría virtual, nos enseña temas interesantes. • Me pareció interesante la tutoría virtual. Al principio tuve problemas para identificar el curso y las actividades, pero después ya no hubo problema. • Buen trabajo por parte de los programadores. • Nos da herramientas para nuestro futuro.

Fuente: Elaboración propia

It should be mentioned that the results and contributions collected will be taken into account for the continuous improvement and updating of the project, mainly improving the aspects

of design, contents and usability, which is highly linked to the satisfaction and comfort perceived by the end user (Ramírez, Téllez and Díaz, 2014). It is considered that there are very positive comments from the students, such as: "The topics helped me in other subjects", "The topics are attractive and useful", "This can help me in my career" or "They teach us interesting topics " It is certainly a reflection that your professional training is being strengthened. However, new needs and topics that interest students are also detected: "violence", "emotional intelligence" and "teamwork", which will be taken into account for updating content.

Instrument analysis 3. Data review

In order to compare the results obtained with the implementation of the virtual tutoring model, the data from the Uttec information system was extracted, considering the pilot generation (May-August 2018) and three previous generations. Table 9 shows the results.

Tabla 9. Resultados estadísticos

Cuatrimestre	Matrícula	Promedio	Núm. de aprobados	Núm. de reprobados	Aprobados (%)	Reprobados (%)	Deserción (%)
May-Ago 2017	183	8.15	172	11	93.98	6.02	0.00
Sep-Dic 2017	228	8.08	212	15	92.98	7.02	0.44
Ene-Abr 2018	247	7.96	215	32	87.04	12.96	0.00
May-Ago 2018	218	8.10	199	19	91.28	8.72	0.00

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Promedio	**219**	**8.07**	**199.5**	**19.25**	**91.32**	**7.63**	**0.11**

Fuente: Elaboración propia

As can be seen in the previous table, although the results of the four-month period May-August 2018 remain very close to the average, there is an improvement with respect to the previous four-month period: the average and the number of approvals were increased, so it can be deduce that virtual tutoring is giving similar results to the face-to-face tutoring of the previous four-month periods.

Discussion

Virtual tutoring takes place in a teaching-learning process, and indeed, as Ausubel's cognitive theory (1976) mentions it, it requires a creative and innovative environment, in order to favor the development of cognitive and creative processes, so that, later, the student develops with autonomy and independence in his professional practice. The above is nothing other than what the implementation of this model in the Uttec pursues, taking advantage of the use of ICT.

According to Marroquín and Forzante (s. F.), Students, when they receive new information, process it, store it and then retrieve it to apply it to new learning situations. And this could be verified, since, although the students of Engineering in Information and Communication Technologies are not in a work environment, it is appreciated that this virtual tutoring modality is an alternative that presents similar results with respect to the face-to-face .

In that same trend, the perspective of Pozo (2009) on the conception of learning as an active process of processing and construction was very useful, through which the individual acquires practical skills or abilities, since in this project closing activities were added which allowed validating that learning actually occurred.

For Uttec, as a result of this project, virtual tutoring has become a process of support, guidance, guidance and accompaniment for tutors, mainly to complement their professional training and to achieve different objectives defined at each level of mentoring and in each session (Ramírez et al., 2018).

However, it should be emphasized that it is not intended to replace face-to-face tutoring, but rather to have an alternative when it is convenient. In addition, considering that it is in an

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iterative and incremental process based on the data obtained, actions will be taken to improve the project and, consequently, the results of the students.

Conclusions

Responding to the research question asked at the beginning of this research: How to evaluate the implementation of the virtual tutoring model for strengthening professional training in Information Technology and Communications Engineering? It was evaluated by applying three different instruments. The first was the evaluation of the continuous process, which was applied to the members of the Academic Body of Tutoring, experts in the subject. The second one was applied to the tutored students of Engineering in Information and Communication Technologies who participated in the piloting through the platform. And the third was the review of statistical data that will give us a quantitative result.

Based on the results obtained, the project is considered acceptable. Of course, there are opportunities for improvement regarding the appropriate use of ICTs in conjunction with the andralogical, didactic and methodological elements used in this project, which although the average, approval and desertion results have improved, there is still a possibility of further development.

An important part in the implementation of the virtual tutoring were the didactic strategies applied, since they offer the tutored several possibilities: from those that are focused mainly on the individual to those who seek collaborative work between the different participants. Although 65.57% of the tutored students who participated in the piloting of the virtual tutoring platform fully agree with the project, we still consider it necessary to increase the degree of satisfaction.

In this project, the activities that will help the guardians cease to be passive and become active were also promoted, and also that the learning does not refer exclusively to a memorial storage of information, but rather that it is designed to do A cognitive structuring. Another important consideration of support in vocational training was to include activities that foster collaborative and cooperative learning such as chats and forums implemented, especially because in the career of Engineering in Information and Communication Technologies, teamwork is very common. It should be noted that today virtual learning environments have gradually ceased to be only a repository of information to become a social tool for knowledge sharing.

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On the other hand, the research carried out under the methodological support of action research was crucial for the correct development of this project. Above all, taking into account the relationship between ICTs and the teaching process, which opened several lines of research, ranging from the design of teaching materials adapted to the characteristics of the project to instructional design, meaningful learning, the design of learning objects, the application of specific teaching strategies, levels of student satisfaction, evaluation, etc.

The last achievement obtained as a result of this project is that, in 2018, thanks to a call from the Support Program for the Development of Higher Education (Pades), where he participated with an institutional proposal for virtual tutoring for the first four months, resources were obtained important that will be used to acquire the hardware and software infrastructure to be able to implement the project throughout the institution.

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