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Artículos científicos

Formación docente en competencias TIC

Teacher Training on ICT Competences

Treinamento de professores em habilidades de TIC

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Resumen

La integración de las tecnologías de la información y la comunicación (TIC) en la labor docente es un tema vigente en los debates de investigación educativa. Este artículo tuvo como objetivo determinar las competencias en TIC del catedrático universitario en carreras del área de informática. La metodología empleada en este proyecto fue descriptiva, con un enfoque cualitativo. Se realizó una investigación de campo en la Facultad de Informática de la Universidad Autónoma de Sinaloa. Los datos se obtuvieron a través de encuestas aplicadas a 152 alumnos y 30 maestros de dicha institución. Entre los hallazgos se encontró que el profesor se muestra altamente preparado en el uso de las tecnologías, las que incorpora con frecuencia en sus actividades y en la evaluación de sus asignaturas; pero requiere reforzar su

competencia en lo concerniente a la publicación de material didáctico propio y aprendizaje colaborativo mediante instrumentos como blogs y wikis, además de que manifiesta poco conocimiento en estrategias metodológicas propias para el trabajo en red.

Palabras clave: competencias TIC, formación docente, educación superior, práctica pedagógica.

Abstract

The integration of information and communication technologies (ICT) in teaching is a current topic in educational research debates. The objective of this article was to determine the ICT competencies of university professors in the area of computer science. The methodology used in this project was descriptive, with a qualitative approach. Field research was conducted at the School of Computer Science of the Universidad Autónoma de Sinaloa. Data were obtained through surveys applied to 152 students and 30 teachers of this institution. Among the findings, it was found that teachers are highly prepared in the use of technologies, which they frequently incorporate in their activities and in the evaluation of their subjects; but they need to reinforce their competence in the publication of their own didactic material and collaborative learning through instruments such as blogs and wikis, besides the fact that they show little knowledge in methodological strategies for networking.

Keywords: ICT competencies, teacher training, higher education, pedagogical practice.

Resumo

A integração das tecnologias de informação e comunicação (TIC) no ensino é um tema atual nos debates da pesquisa educacional. O objetivo deste artigo foi determinar as habilidades em TIC do professor universitário nas carreiras de ciência da computação. A metodologia utilizada neste projeto foi descritiva, com abordagem qualitativa. Uma investigação de campo foi realizada na Faculdade de Informática da Universidade Autônoma de Sinaloa. Os dados foram obtidos por meio de questionários aplicados a 152 alunos e 30 professores da referida instituição. Dentre os achados, constatou-se que o professor é altamente preparado no uso das tecnologias, que frequentemente incorpora em suas atividades e na avaliação de suas disciplinas; mas exige o fortalecimento de sua competência quanto à publicação de seu próprio material didático e aprendizagem colaborativa por meio de instrumentos como blogs

e wikis, além de demonstrarem pouco conhecimento de suas próprias estratégias metodológicas de trabalho em rede.

Palavras-chave: competências TIC, formação de professores, ensino superior, prática pedagógica.

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Introduction

Information and communication technologies (ICT) have modified society and changed the perspective of the world, to such an extent that they are now part of daily life. The speed of communication is generating an unprecedented change; people are closer regardless of time or distance. Undoubtedly, this impacts all areas of life, but one of the most influenced sectors is education, and if possible even more in universities, where these advances are manifested in an evident way due to the fact that in these entities there is access almost permanent access to the Internet by students.

The effect, the current environment, in constant evolution due to the use of ICT, has shaken the educational sector and has led teachers to see the need to acquire new skills to solve and adapt to present challenges, yes, but also to anticipate the future. Thus, it is necessary to develop teaching skills in the use and exploitation of technologies. In this line, Montero and Gewerc (2018) point out that society demands new strategies for the generation and appropriation of knowledge from universities. This implies incorporating what is current, what is associated with the use of ICT, in academic functions so that, using these instruments, new epistemological, pedagogical, methodological, didactic and evaluative paradigms can be activated that articulate a modernized educational curriculum and according to the current demands of students and the professional world (Hernández, Arévalo and Gamboa, 2016).

The use of ICT is a topic of great importance in both public and private universities, because these tools allow to improve the interrelation between the teacher and the student, motivate the student to approach knowledge and stimulate the generation of new situations of learning. Through these instruments, new social environments are generated where the most diverse forms of relationship between human beings can be developed, including teaching-learning processes (Falco, 2017). Higher education entities should promote innovative teaching experiences using ICTs; generate a renewal in teaching work using

technologies; promote the use of new teaching strategies based on these tools (Arancibia, Cabero y Marín, 2020).

Thus, incorporating ICTs into teaching is essential today, however, in some cases, little training in the use of these prevents the teacher from using them efficiently. In order to teach, subjects must develop certain pedagogical competencies, but currently, coupled with this package of skills and knowledge, it is necessary to update and train in the use of these state-of-the-art tools, and know how to create learning situations with them that lead to learning. development of the students. The teacher is facing a new scenario and requires different ways of approaching it, being key that he is competent in the use of ICT, and thus becomes an element of change (López, 2021).

The university teacher in Mexico has gradually faced the new demands that arise in the educational sphere with the use of new technologies, a situation whose difficulty is constantly renewed due to the rapid technological advancement in recent years (Pozos and Tejada, 2018). . Therefore, teachers must also be constantly updated and trained in the use of these tools. This demand has been particularly accentuated in those educational centers that have a wide range of ICT resources. However, as we have already said, teachers are often not competent in their use, which causes them to be inefficient, and their educational application is not as expected by the institution itself.

At present, ICTs are considered support tools for learning. For this reason, the technological skills of teachers are essential when producing digital educational resources that offer innovative practices that facilitate student learning, as well as didactic strategies that stimulate their participation in the construction of knowledge. In their research, Lanuza, Rizo and Saavedra (2018) point out that one of the fundamental aspects for the 21st century university is that teachers can transmit and produce knowledge, either in person or remotely, using technologies. Under this new teaching paradigm, the teacher, a key element in any renewal process in educational institutions, must participate in the pedagogical transformation of schools.

The university must have professors with a profile that facilitates the students' mastery of ICT, who resort to these tools as support in didactic activities and as a means to motivate the student, without neglecting other ways of educating (Laurente, Rengifo , Asmat and Neyra, 2020). Through the use of technologies, autonomous learning can be stimulated, as long as the process is advised by a trained teacher interested in the correct use of available technological resources. The foregoing can generate an erroneous perception about ICTs,

that they reduce the role of the mentor in the teaching process, which is wrong, since they rather modify and expand it: the teacher goes from being a facilitator of knowledge to a companion in the learning process.

For higher education, the integration of technologies represents a field of great interest and, therefore, fertile ground for research. Although each educational institution tends to improve the learning of its students by including ICT, and in turn makes significant infrastructure efforts to achieve this objective, there are hardly any studies that show the degree of application that teachers give to these tools in their work. teacher and its impact on student achievement (Cepeda and Paredes, 2020).

Among these few, the work of Casal, Cebreiro and Fernández (2021) stands out, who, among other things, conclude that if the educational environment does not motivate new teaching methodologies supported by these instruments, educational practices will not be modified. They also point out that teachers must be able to improve their ICT skills and obtain pedagogical knowledge about the use of ICT for their educational practices. Another important aspect expressed by the authors in question for the implementation of these tools is related to the contents and technological resources for schools. It is essential to have access to interactive digital content for students.

The results obtained by Fernández de la Iglesia, Fernández and Cebreiro (2016) show that the incorporation and use of these tools in schools has been a relevant issue in recent years. However, the failure of teachers in the use of these instruments has interfered with a real integration of ICT in the classroom. From the point of view of Fernández de la Iglesia et al. (2016), training aimed at the pedagogical use of technologies and the production of digital materials in virtual spaces that favors collaboration between the various participants is required.

Centeno (2021), For its part, it analyzed the relationship between the technological training received and the digital teaching skills of teachers. The results show that teachers occasionally use them to organize their course, evaluate and give tutorial attention to students or carry out research activities. Also, that the levels of pedagogical innovation are very low, which is why a little impact of the technologies in the educational practice of the teacher is inferred, despite a positive training and attitude towards ICT. This study shows the training needs and improvements of the professor in terms of methodology and didactics, new evaluation methods, organization procedures and learning management using technologies.

Finally, Claramunt (2020) establishes that the learning system used by teachers through classroom technologies generally maintains the passive role of the student, because the teacher continues in his role as transmitter of information, which does not bring Significant change from the traditional teaching model. To achieve a substantial transformation in teachers, the perceptions, beliefs and expectations they have must be shaped so that they themselves are the ones who incorporate learning and obtain the maximum benefit from the use of ICT in their professional work. The foregoing shows how existing technological resources are being renewed in schools, however, the didactic use provided to these tools by teachers and the type of activities programmed for students do not establish a relevant formative renewal. It is preponderant that within any educational policy guidelines be established that promote, in addition to the use of ICT in universities, the development of skills in teachers on the use of these, and in short, the use of technologies from a point of view. innovative didactic view (Lugo e Ithurburu, 2019).

Methodological process

In this descriptive research, we sought to know the practices of teachers and students regarding a specific fact (the competent use of ICT in their professional work) and the meanings they attribute to it. The methodology used was qualitative, through a field study. One of the tools used during the investigation was the questionnaire, which was applied to professors. For the registration of indicators, content analysis and discussion group techniques were used. From there, an instrument was developed that served to obtain an overview of the ICT skills of the university teacher. The survey was strongly influenced by the one prepared by Lázaro, Gisbert and Silva (2018) on the technological competences of the teacher in higher education institutions in Latin America. In this, various aspects were determined regarding the handling they give to ICT in the classroom and their level of competence in handling them. In the end, it was made up of the following four categories:

1) General and personal aspects of the teacher.
2) Basic training in technologies, uses, frequencies of use and adaptation that teachers make of technologies for their profession.
3) Organizational aspects and dissemination through ICT.
4) Reflection on the management of ICT in their teaching work.

In the first category ("General and personal aspects of the teacher"), the research subjects were asked for their general information (age, sex, academic degree, among others). In the second category ("Basic training of teachers in technologies"), they were asked to define through sentences the mastery of basic technical aspects related to the use and choice of technological tools for their classes (accessibility, web 2.0, among others), with the purpose of establishing the level of knowledge they have to develop their professional work managing ICT. For this, a four-level Likert scale was used: null, superficial, deep and very deep. In the third block ("Organization and dissemination through ICT"), the trainer was asked about his experience in the use of these instruments and the frequency of evaluations through the use of technologies. For this, a Likert scale was applied in four levels that were defined as: never, sometimes, frequent, very frequent. In the fourth section ("Reflections on ICTs in their teaching work"), the instructor was invited to reflect on the use of these tools for their teaching practice, student learning, and educational innovation.

With this questionnaire, various aspects related to the use they give to ICT in the classroom and their level of competence in handling them were determined. The subjects surveyed were academics from the Mazatlán School of Informatics of the Autonomous University of Sinaloa. During the period from November 8 to December 11, 2021, the questionnaire was applied to them using the Google Forms tool. For the application of this instrument, the entire population of teachers of the faculty was used, which, being a small number, was affordable to carry out.

The Faculty of Informatics Mazatlán has two shifts for each of the careers that are taught: a degree in Computer Science and Engineering in Information Systems. In total, it has an enrollment of 564 students in both shifts (morning and evening). To contrast the information provided by the tool applied to teachers, another questionnaire was supplied to a representative sample of students. This sample consisted of 152 students. This calculation was made with the well-known formula used for finite populations:

$$n = \frac{N}{1 + \frac{e^2(N-1)}{Z^2 pq}}$$

It should be remembered that in this formula n = size of the sample that we want to know, N = known size of the population, e = sampling error, Z = confidence level and pq = population variance.

For the estimation of the sample, 95% confidence and 5% margin of error were defined. This tool consisted of 27 questions that covered the following categories: general aspects of the student, availability of technologies and connectivity, and the use and management of technologies by the teacher. Once the information was collected from both the teacher and the student, it was analyzed.

Analysis and interpretation of results

The results of the analysis of the items included in the questionnaires are presented, which provide an overview of the current situation of the competencies of the teachers participating in this project. Through this diagnosis, the vision of both the teacher and the students in the categories scrutinized is perceived.

In the first section, referring to the general data of teachers, the results were that the largest number of professors is located in the range of 41 to 50 years (40% of the participants are placed in that range). The lowest percentages are the trainers who are over 60 years old (3%) and the youngest teachers whose range is between 20 and 30 years old (14%). Regarding the sex of the research participants, it was found that 70% (21) of the teachers belong to the male gender and the remaining 30% (9) are female. When determining the academic degree of the professors, it turned out that 12 professors have a doctorate degree, 11 have a master's degree, and seven have a bachelor's degree.

In the second section, where the participants were asked about the degree of knowledge they possess to solve daily problems and resolve technical incidents related to the use of technological tools, it was found that 73% of the teachers claim to have deep or very deep knowledge. (53% deep, 20% very deep). On the contrary, 27% of teachers do not know how to solve these incidents or have a superficial preparation. Sometimes it is difficult to have technical support to solve technical difficulties related to the use of computer equipment or other technology, so it is important that you are trained to solve simple incidents related to its use.

A very important aspect in the use of technologies are issues related to security. When teachers were asked about their knowledge to use security and risk prevention measures such as the use of passwords, firewall, antivirus, etc., 43% expressed having a superficial knowledge, 27% a deep knowledge and 30% a very deep knowledge.

When asked about the degree of mastery that the teacher has to use ICT tools independently, 73.3% of the teachers indicated that they had deep or very deep knowledge, compared to 26.7% who confessed to having a superficial or null degree. Regarding the degree of knowledge that the trainer possesses to evaluate their students through the use of ICT, 77% have, or rather confess to have, a deep or very deep knowledge, while 23% null or superficial. Specifically, 57% show deep knowledge and 20% very deep, against 13% who maintain that it is superficial and 10% null.

The factors that lead a teacher to select an ICT tool for the classroom are usually diverse. Table 1 shows those with the greatest weight for the participants.

Table 1. What factors does the teacher take into account when choosing an ICT tool?

Pregunta	Nulo	Superficial	Profundo	Muy Profundo
Facilidad de uso	1	3	12	14
Relevancia científica y profesional	0	5	15	10
Innovación tecnológica y didáctica	3	11	7	9
Si resuelve necesidades de aprendizaje	0	2	17	11
Accesibilidad	4	2	13	11
Facilidad de acceso para todos los alumnos	2	2	18	8
Tiempo que tengo que dedicarle	1	7	16	6
Recurso motivador para los alumnos	2	1	8	19

Source: self made

One of the most valued aspects by 93.3% of teachers is that the selected resource meets the student's learning needs. The motivation that the ICT resource can generate among students is another factor that 90% of teachers estimate in depth. On the other hand, 86.66% of the teachers estimate the ease of access to all the disciples as relevant or very relevant. In general, it is shown that all the factors that were questioned to the trainers have been valued positively. Continuing with the variables that lead a professor to select an ICT tool for the classroom, 86.6% consider the ease of use of the resource to be a deep or very deep aspect, 83.3% qualify scientific relevance as something deep or very deep. and technology that the resource has, 80% state that they weigh accessibility (that it can be used by all students, even

if some of them have a disability) and 73.33% conclude that the time spent by the respondent is of great importance in this matter. An aspect that, although valued positively, is less appreciated is technological and didactic innovation (53.33% of the participants).

An equally important aspect to consider in the professor's competencies when using these instruments is their methodological use. The results show that a considerable percentage (60%) of the teaching staff of the faculty in question has zero or superficial knowledge of the different methodological strategies to use ICT in the classroom, this against a lower percentage (40%) of the teachers who have a deep or very deep knowledge about these strategies.

Regarding the objective of determining the knowledge that teachers have in the use of instruments and applications for their educational work, it was established that the tools with the greatest mastery by the respondents (83.33%) are those related to communication (chat , email, forums, etc.); then there are search and publishing tools and text editors (80% of teachers stated that they have deep or very deep knowledge); behind these are the virtual classrooms and specialized search engines (Google Maps, Google Scholar, etc.), since 56.67% of those surveyed use them. Regarding the applications with a moderate level of use, electronic boards are located, of which only 33.33% manifested a degree of deep or very deep knowledge. Immediately after, with a percentage of 40%, multimedia editors and collaborative work tools (blogs, wikis, etc.) were placed. On the other hand, 46.47% of them showed advanced knowledge of both Prezi and social networks (Facebook, Twitter, etc.) for its application in their didactic work.

In relation to the average number of hours that the teacher uses the technologies in the classroom, 30% of them have 1 to 15 hours per month, while 70% use 16 or more hours during a month. Table 2 shows the results regarding the actions that teachers carry out to improve ICT skills.

Table 2. The teacher carries out the following actions to improve ICT skills

Pregunta	Nunca	Alguna vez	Frecuente	Muy frecuente
Evalúo mis prácticas docentes con TIC	10	11	7	2
Participo en foros o espacios de reflexión sobre TIC	9	16	3	2
Utilizo diferentes fuentes de información digital	0	6	7	17
Accedo a plataformas y repositorios en Internet	0	5	9	16
Participo en redes docentes sobre el uso de TIC	5	16	6	3
Participo en grupos de investigación didácticos con TIC	5	17	5	3
Comparto mi experiencia docente con TIC	9	8	11	2

Source: self made

According to the results shown in Table 2, only 30% of the teachers who evaluate their teaching practices with the use of technologies do so frequently or very frequently, while 70% did it once or never. In addition, 16.67% participate frequently or very frequently in forums or spaces for reflection on the use of technologies in teaching, compared to 83.33% who did so once or never. Regarding the use of different sources of digital information, 80% do it frequently or very frequently, while only 20% did it once or never. In relation to access to platforms and repositories on the Internet, 83.33% do it frequently or very frequently, compared to 16.67% who practiced it once or never. On the other hand, regarding the participation in educational networks on the use of technologies, 30% do it frequently or very frequently, however, it should be noted that 70% of the participants did it once or never. When the trainers were asked about their participation in didactic research groups with these tools, 26.67% confessed that they do it frequently or very frequently, compared to 73.33% who have never participated or only once. Finally, they were asked if they share their teaching experience with ICT, 43.33% of them do it frequently or very frequently, compared to 56.67% who have never participated in a dynamic of this type or have hardly ever done so.

Regarding the publication of their own didactic material on the Internet, 33.33% publish material of this type frequently or very frequently, compared to 66.67% who did it once or never. The participants in this research were asked if they reflect on the impact of ICT on the professional future of their students and positive results were obtained, since a large part of the teaching staff (76.6%) stated that they made these reflections, specifically 22 respondents; while a low percentage (23.4%) does not. When the trainers were asked if they know and reflect on the potential that technologies offer to improve their professional activity, 73.3% answered affirmatively. The results of this item are very acceptable.

The teacher was questioned if they considered positive the impact that ICTs have on the learning of their disciples, and 87% were in favor, while only 13% indicated the opposite. In other results referring to the participation in training activities related to the pedagogical use of ICT by the teacher, it was obtained that 73.33% carry out this type of activity, while 26.67% do not.

When asking about the knowledge that the teacher possesses to select an ICT resource, 40% stated that they had a superficial understanding, while 60% declared that they had a deep or very deep knowledge. When the professor was inquired about the availability of tools or equipment offered by the Faculty of Informatics Mazatlán to use different methodological strategies driven by ICT to motivate students, 70% reported that said availability was null or superficial, while 30% exposed that it was deep or very deep. When teachers were asked about their ability to stimulate student participation in virtual communication spaces, 70% stated that said ability was null or superficial, while 30% reported that it was deep or very deep.

Another question reflected in the questionnaire was related to the way in which the teaching staff participate in the various institutional support programs for the management of ICTs; here 40% answered that it was null or scarce, compared to 60% who answered that it was active or very active. In the question regarding the use of free software for their work, 60% of the teachers confessed that they use it superficially or not at all, while 40% do so deeply or very deeply.

In the questionnaire, the teacher was also asked if he published his scientific or didactic production and if he did so, if he did so in open access spaces, to which 40% of the teachers stated that they did so frequently or very frequently, 10 and 2 teachers respectively; while 60% stated that they did it once or never, 11 and 7 in that order.

However, the results of the questionnaire applied to the students to compare it with the one made to the teachers are shown and analyzed below. One question of said instrument was related to the knowledge that the teacher shows about basic concepts of ICT (operating system, Internet, hardware, applications). In this regard, 65% of the students assured that said knowledge was deep or very deep, while 35% stated that it was superficial or null. Another questioning referred to the ability shown by the teacher when selecting and using an ICT resource for the class: 22% stated that it was very deep and 34% indicated a deep competence, while 41% was superficial and only 3% stressed that it was null.

Regarding the knowledge that the teacher shows to select or use an ICT tool for the class, 22% of the respondents stated that the teacher does it in a very deep way, 34% indicated a deep knowledge, while 41% superficially and only 3% highlighted that it was null. Another question in the questionnaire asked to the students was related to the knowledge shown by the trainer to solve a simple technical incidence, and it was obtained that 38% believed that the teacher had a null or superficial understanding, while 62% revealed a deep or deep understanding. very deep to solve these situations. Table 3 details the results about the knowledge shown by teachers of the technological tools they use for their work, from the student's perspective.

Table 3. The mastery shown by the teacher when using technological tools

Pregunta	Nulo	Superficial	Profundo	Muy Profundo
Comunicación virtual	15	76	46	17
Redes sociales	25	83	41	5
Herramientas de trabajo colaborativo en línea	32	79	40	3
Aulas virtuales	35	58	45	16
Herramientas de búsqueda y publicación de información	21	45	45	43
Editores de texto	14	39	72	29
Editor multimedia	17	37	59	41
Buscadores especializados	24	52	38	40
Pizarrones electrónicos	40	39	33	42

Prezi	38	42	45	29

Source: self made

The applications with the greatest mastery by teachers, with a deep or very deep degree of mastery, from the student's point of view, are text editors and multimedia editors (65%). Immediately, the students declared that 60% of the teachers have a deep or very deep knowledge when using the search tools and specialized search engines. Then tools with a not so high level of approval from the student to the teacher are shown; of electronic whiteboards, virtual classrooms and Prezi, only 50% of the trainers exhibit deep or very deep knowledge; 40% of the students stated that the domain of their own communication tools such as email, chats, forums by the instructor is deep or very deep, and 30% of the respondents indicated that the expertise that the pedagogue has when using social networks and collaborative work tools is deep or very deep.

In the results referring to the mastery of methodological strategies by the teacher, 52% of the students indicated that this knowledge is deep or very deep, while 48% indicated that it is null or superficial. Regarding the mastery that the trainer possesses to stimulate student participation in virtual communication spaces, 48% of the latter stated that said ability is deep or very deep, while 52% indicated that it is null or superficial. Regarding the way in which the professor uses ICT to evaluate, 58% of the respondents indicated that it was deep or very deep. When the participants were asked about the way in which the instructor uses the ICT support services for teachers provided by the university, 65% indicated that they did so in a deep or very deep way; only 24% indicated that the mentor's use of free software tools is deep or very deep.

Finally, 80% of the student sample believes that the use of ICT by the teacher impacts their learning, against only 20% who responded otherwise. Regarding the degree of motivation generated by the use of technology by teachers, which is considered a very important aspect to take into account when using these tools to bring the student closer to knowledge, it was found that 36% of those surveyed stated that the interest aroused by the ICTs used by the teacher was very deep, 39% indicated that it was deep; If the previous levels of motivation are added, the result is that 75% of students perceive that the teacher uses these tools in their professional work as motivating, while only 25% stated that the motivation received was superficial.

Discussion

It is important that the teacher has an outstanding preparation in the use of ICT for the development of his professional activity, hence the importance of this research and its results. An essential attribute to take into account in the use of ICTs is related to the security and privacy of information; The teacher must have the necessary knowledge to safeguard all information stored on their computers and prevent unauthorized access. In this investigation the participants declared themselves to be highly competent. This coincides with another study, that of Avello and López (2015), where most of the teachers who participated were able to produce and safeguard relevant documents using digital instruments.

The teachers spoke with extensive knowledge in their autonomous learning of ICT tools, which is substantial for a planning that includes the use of these Internet-based instruments and resources in order to transform the classroom into a place where student learning is based on exploration, investigation and collaboration under the guidance of the trainer. Similar results were shown in the Feria and Zuñiga (2016) study, who point out that teachers apply various strategies based on ICT and thus promote an active and autonomous education.

Technologies are a useful instrument with great potential in the teaching and learning processes, but it is necessary that there are defined pedagogical criteria that guide their applicability, and teachers must be trained to do so. In this regard, the respondents indicated their preference for those resources that solve the student's cognitive needs and are capable of motivating them, in addition to being easily accessible. Teachers can access various ICT tools to motivate their students' learning and bring them closer to knowledge, however, this great diversity of options is making it very difficult to define which is the most appropriate in a given learning situation, so it is recommendable to specify which factors are taken into account to select the appropriate resource. Related to the above, Cruz (2019) underlines the importance of instructing the student in the appropriate and critical use of digital elements to boost the levels of achievement.

Technologies demand that teachers acquire a high degree of mastery of tools and applications related to ICT, that they are capable of developing new functions and also new approaches to achieve the integration of these instruments in the classroom. Effective teaching strategies, promoting collaboration with other colleagues in virtual spaces through various tools, improving the implementation of these tools in didactic activities, all this

strengthens the integral formation of the student. In the work of Martín, Hernández and Mendoza (2017), teachers valued participation in digital environments with other educators, which, they indicated, favors the generation of knowledge in the student and curricular differentiation.

For adequate training in ICT, teachers must be actively involved in technology-assisted learning environments because they promote innovation in professional practice, disseminating these new experiences with other colleagues, promoting best practices and methodological strategies with these tools, the latter aspect in which the participants of this work require attention.

To solve the lack of training in teaching strategies with ICT, the teacher must reflect on how and in what way he uses these tools in his educational practice. This process will lead you to generate new schematics for your students. The potential of technologies lies in how they are adapted to the teaching-learning model. The professional training of the teacher in the application of these instruments will improve the didactic process of the subject taught. To obtain a correct incorporation of these mechanisms in any didactic process, it is necessary that various conditions are met and that a series of steps be carried out. One of these situations is that the teacher knows the various strategies for using ICT in the classroom.

Internet and cloud services have become the repository of people's knowledge, it is necessary for teachers to participate in virtual spaces and publish their didactic material through the instruments at their disposal. Another aspect to highlight in teachers is the use of complex or specialized technological tools that allow the development of skills in their students through virtual learning environments. Hernández, Prada and Espinel (2022) coincide in indicating the potential of digital environments designed by teachers, promoting the active and autonomous learning of students. It is highly recommended that teachers keep up to date in the use of ICT and thus generate usable knowledge in the teaching-learning processes in the classroom.

Conclusions

ICT proficiency is an aspect that university teachers must have for the performance of their professional work. The management of technologies is manifested as a basic competence for the teacher today. Consequently, it is necessary that they have the knowledge

related to the management of technologies for their work, as well as planning didactic activities with the use of these tools.

The teacher of the Faculty of Informatics Mazatlán has been evaluated in the following dimensions: a) basic training, uses, frequency and adaptation that teachers make of technologies in their work, b) organization and dissemination through ICT and c) reflection on ICT in their teaching work.

In the first item, the teacher shows competence in the basic management of ICT and the conceptualization regarding its use; he knows how to protect the computer equipment through passwords and antivirus and, in general, he understands how to solve minor incidents that occur with the use of technologies. The teacher shows a high degree of competence when learning to use them by himself. The teacher, in order to develop his professional activity, expresses a greater mastery of technologies related to text editing and information search, but needs to reinforce his competence in those concerning the use of social networks and collaborative learning through instruments such as blogs. and wikis.

Social networks are another aspect to consider, since the teachers participating in this research, although they use them personally, most of them do not use them as teaching tools. These spaces can become a learning and knowledge scenario through an adequate intervention by the teacher. On the other hand, teachers have a relevant use of technologies for their classes, since they incorporate them in more than half of their classroom activities, during their monthly teaching practice, even 70% of professors use them in 16 or more hours.
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In the second category, there is a notorious deficiency on the part of the teaching staff in the knowledge of the different methodological strategies with ICT. This little knowledge on the part of the trainer results in a poor use of these strategies for their teaching work. The publication by the teacher of didactic material or scientific production through ICT is another aspect to be reinforced in their professional practice. Publications by academics in web environments or using technologies allow their knowledge and research to be shared with their students and even with other colleagues, increasing network collaboration. Regarding the evaluation of student learning, there is a strong point of the ICT competence of teachers who claim to use it frequently in the evaluation processes of their students.

In the third category, the university professor considers the use of ICT important in the future of students, when entering the labor market, in addition to recognizing them as tools to improve teaching practice. The professor is informed and interested in various

educational innovation activities carried out by the university. This knowledge motivates him to carry out some of these practices and incorporate them into his professional work, which generates a positive impact on the student. Even so, a more active participation of the teacher in ICT training actions is necessary. For this, it is necessary to determine motivational actions. His participation in courses, seminars and workshops on ICT training is a good option to reinforce his knowledge in this area. The students of the Faculty of Informatics Mazatlán state that the use of technologies in a competent manner by the teacher favors the generation of learning for them, because they arouse their interest and increase their capacity for analysis when facing any problem, all of which contributes to improve educational outcomes.

Teachers are competent in instrumental and cognitive management using technologies, which offers wide possibilities to use these tools with good judgment. However, they were not very capable in relation to their didactic and methodological use. These deficiencies of teachers prevent an effective management of ICT in their teaching practices, so that they serve as innovative instruments, a result that coincides with previous studies that indicate the weak knowledge that teachers present to use technologies as a motivational element for students and to generate new forms of learning.

Future lines of research

You can delve into topics such as the following: 1) virtual tutoring, 2) development of educational innovation projects based on ICT, 3) institutional educational policies with ICT, 4) impact of ICT skills of university teachers on their students and 5) participation in continuing education activities related to the use of ICT.

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