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Perceptions on Information and Communication Technology among the Faculty of a Mexican University: the South University Center of the University of Guadalajara

Percepción sobre las tecnologías de la información y la comunicación en los docentes de una universidad mexicana: el Centro Universitario del Sur de la Universidad de Guadalajara

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Abstract

It is the faculty members who can generate the greatest changes in universities around the world, based on the establishment of defined policies. On the teachers falls the responsibility of training and orienting students—the primary users of these institutions. The objective of the present study is to define what have been the perceptions and the changes among teaching faculty in the process of implementing information technologies in the South University Center, University of Guadalajara (Mexico). Questionnaires were distributed to 42 of the institution's 320 teachers. Four areas were addressed: technological infrastructure; teacher training and support; reasons for implementing information and communication technologies; and modification of the teaching/learning process. Based on the surveyees' answers, categories of analysis were developed; these were used to define the needs of the group. Next a process of research-action was carried out with a group of faculty interested in changing their educational practices; the group members received several different training courses. Most of the professors accepted the implementation of the technologies in their academic programs, although many of them had not put them into practice. On the other hand, they pointed out the importance of having the necessary infrastructure and training support, as well as constant technical, methodological and didactic assistance.

Key words: Teacher training, information and communication technologies.

Resumen

Los docentes son los actores que mayores cambios pueden generar en las universidades de todo el mundo, a partir del establecimiento de políticas definidas. En ellos recae la responsabilidad de formación y orientación de los alumnos, principales usuarios de estas instituciones. El objetivo del presente trabajo es definir cuál ha sido la percepción y el cambio de los docentes en el proceso de implementación de las tecnologías de la información en el Centro Universitario del Sur, de la Universidad de Guadalajara (México). Para ello se aplicó un cuestionario a 42 de los 320 docentes de dicha institución, en el que se abordaron cuatro ejes: infraestructura tecnológica, apoyo y formación docente, motivos para la implementación de las tecnologías de la información y la comunicación, y modificación del proceso de enseñanza aprendizaje. A partir de las respuestas de los docentes se generaron categorías de análisis, con las que se definieron las demandas del grupo. Después se trabajó en un proceso de investigación-acción con un grupo de docentes interesados en cambiar su práctica educativa, a quienes se les impartieron diferentes cursos de capacitación. La mayoría de los profesores mostró aceptación a implementar las tecnologías a sus programas académicos, aunque muchos de ellos no lo han llevado a la práctica. Por otro lado, señalaron la importancia de contar con la infraestructura necesaria y el apoyo formativo, así como una asistencia técnica, metodológica y didáctica constante.

Palabras clave: Formación docente, tecnologías de la información y la comunicación.

Introduction

The last two decades have been marked by the influence which technology has had on all areas of human activity. While it is true that the percentage of people

having some degree of contact with this technology is still very low,[1] there is no denying that this number is decreasing every day. A simple comparison of the cost of certain technologies five years ago with the current cost bears this out. In 1990, there was in Mexico one cell phone (mobile phone) subscriber per thousand inhabitants; in 1999 this number increased to 79 subscribers. In 1995 there were 0.2 Internet users per 1,000 inhabitants, while in 2000 the figure increased to 9.2 users. A look at politics, health, power, economy will show the development fostered by technology in all of these areas.

The area of education has been no exception, especially at the university level. Year after year the amount of technology that the universities have acquired and distributed in all their areas has increased exponentially. In 1995 the University of Guadalajara (Mexico) had 3,894 computers (PCs), of which 2,523 were designated for use by teachers and researchers from various university centers. By 2004 there were 24,978 computers, of which 15,009 were for the exclusive use of teachers, and 3,115 for research. This represents an increase of 641% in 10 years.

In the present case, that of the South University Center, University of Guadalajara, the use and management of information technology and communication (ICT) began in 1998, the year when computer equipment was purchased for the use of the different administrators, and the use of email and Internet was promoted for teachers and students.

Starting this year, there has been as push for the implementation of various technologies in the Center's academic programs, such as videoconferences; self-access classrooms; use and management of various software packages; designing of online courses; and use of e-mail and the Internet. Work has also been done on developing teaching materials in digital format, which in one way or another, has come to reinforce the use of technology. However, there is still much resistance toward accepting the changes which technology produces in the area of education; while a vast majority of teachers accept the frequent use of email, few have been able to integrate this tool as an aid in their educational programs.

History of technology at the South University Center

The South University Center (CUSUR)* was created in 1994 after the decentralization of the University of Guadalajara, which began in 1989. The main objective was to offer the university's educational programs and other services throughout the State of Jalisco (Mexico), so that students would not have to relocate to the metropolitan area,[2] and as part of an effort to bring culture and art to the entire population.

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* For ease of reference, where the names of organizations have been translated from the Spanish, their acronyms have been retained as given in that language. In the case of international organizations which have commonly-used acronyms in English, those acronyms have been used.

As regards the inclusion of the first technologies, in 1994 there were only a few computers, and there was no Internet access or email. It was not until 1998 that those tools began to be used. Beginning in 2000 there were more-advanced machines, including 40 computers with Pentium III processors and with basic spreadsheet and word-processing programs, plus equipment for video-conferencing, etc.

The CUSUR in 2005 consisted of 322 faculty members, of which 228 were part-time, 67 full-time, 24 associates and 1 half-time. There were 3,035 students. The center has 687 computers, all with Internet access; 340 of the computers were earmarked for use by students and those teaching the courses.

It is important to point out that in the CUSUR, as in most of the University of Guadalajara centers, part-time teachers do not have their own offices or personal computers, but have to go to the computer rooms the students use. However, they all have email service, and can request equipment for short-term projects in some departments of the Center.

As we can see, the number of computers has increased considerably, and full-time teachers have benefited from this increase, since each has a personal computer. It is expected that in a short time this will be reflected in a diversification of instructors' use of email and the Internet in the programs they are handling.

ICT and the university

One factor that has prompted major changes in universities has been the implementation and development of ICT, which have rapidly evolved since they were initiated in the mid-70's. Bates (2001)** mentions that some of the reasons these institutions are changing are a) the need to "do more with less"; b) society's changing needs of learning; and c) the impact of the new technologies on teaching and learning.

Gradualism in the implementation of ICT has allowed these to form a natural part of institutional life; thus, the digital language is expanding in all areas, in such a way that it is penetrating into the academic programs. According to Castells (2002, p. 57), the historical relationship of technological revolutions shows that all are characterized by their ability to penetrate every sphere of human activity, not as an exogenous source of impact, but as the very fiber of this activity.

It should be noted that there is a gap between the change which the mere introduction of ICT produces, and that which this introduction generates in the institution's basic functions. That is to say that it is not enough to implement new

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** Translator's note: As the original versions of the works originally produced in English or in some language other than Spanish, and cited in this work, were unavailable for use in this translation, it was necessary to employ the technique of back-translation, for which we offer our most humble apologies.

technologies; to achieve the desired ends, it is necessary that this implementation be accompanied by profound changes in the academic and administrative structure, in order to obtain the ends desired.

One such desired end is to equip graduates with the competencies necessary to allow them to be inserted successfully in the society's production force; these competencies, however, have changed dramatically in recent decades. Romiszowski (1997) points out that the competencies that will dominate the next generation and will allow it to adapt itself successfully to changes in the environment will be, inter alia, self-directed learning, and *Just-in-Time Training* (JITT) by means of skills such as metacognitive analysis of information and the creative resolution of problems.

To Duart and Sangrá (2000), the use of ICT in the university space allows the development of three elements: a) greater flexibility and interactivity; b) connection with teachers and other students, by allowing greater collaboration and participation; and c) easier access to study materials and other supplementary sources of information.

This leads us to rethink existing educational models, which are centered on the teacher's presentation, with the students passive. Today's challenge is to adapt all the social, economic and technological changes to existing education programs, and to produce graduates with comprehensive skills, in keeping with the demands of the productive environment.

Teachers and the use of technology

In recent decades, dozens of virtual universities have been created on the five continents. The traditional universities have chosen to design programs and materials related to the new information and communication technologies. This can be seen in the universities' web sites, now commonly used for presenting themselves to the world.

However, this diversity in the educational offer and the acquisition of computer equipment, seldom go hand in hand with the adequate training which teachers, administrators and students require to make educational programs function properly. In the case of teachers, this lack of preparation is accompanied by the administration's imposing new methods for teaching their courses—resulting in the generation of widespread confusion in this sector.

For Delors (1996), Bates (2001), Diesbach (2002), Epper and Bates (2004), Sangrá and González (2004), Barocio (2004) and Pedró (2004), among many others, teachers are the principal conductors of institutional change, since administrative policies have little or no value if their application does not begin with the very foundation of the institution's various branches. The use of technology should be presented as a means to an end: to improve educational processes,

thus inducing changes in attitudes and teaching methods that meet the demands of today's society.

According to Delors:

> Teachers play a key role in shaping attitudes—positive or negative—concerning study. They are the ones who ought to arouse curiosity, develop independence, foster intellectual force and create the conditions necessary for the success of formal education and lifelong learning (1996, p. 157).

However, one of the major challenges has been to overcome teachers' resistance and fear on the subject of using technology. And, as noted by Bates:

> In any institution the different teachers will take different positions regarding the process of change: beginning with fear and anger, resistance, lament for the old days, the wary acceptance of the new; and, finally, coming to an absolute faith in change, or defense of it (2001, p.135).

Although it is true that it is the teacher who must set an example for the students regarding the appropriation of knowledge; reflection and analysis of information; the process of learning to learn; in the case of the technologies, teachers have lagged behind.

In some educational institutions, students of the past two decades have sought their own tools with which to facilitate their learning processes; they have developed the competencies that allow them easy access to new technologies; and thus they have "obliged" the teacher to seek continuous updating.

It is not unusual to see a whole group of students organize a *chat* session using some instant messaging system, create complex directories of Email accounts, and manipulate all sorts of information the Internet provides. On many occasions they have been the first to use the projector and laptop computer for their presentations in the classroom, and have been giving teachers an example of openness and availability toward the new, the recent, the practical.

In the present case, information and communication technologies were significantly introduced in the CUSUR in 2001, the year when the Department of Learning Technologies was created as a support and orientation agency for programs offered at the Center.

Also set in motion was a program of teacher training in various areas such as use and management of videoconferencing equipment, use of self-access classrooms, self-instructional materials design, learning assessment and management of the *Web CT* platform for teachers who wanted to develop *online* courses.

During the last three years, the CUSUR has offered around 47 courses and workshops related to the above areas; more than 65% of the teachers have participated in these—an important advance in updating and teacher training.

Methodology

a) Scope of research

According to the classification of Danhke (quoted by Hernández Sampieri, 2003, p. 114), there are four types of investigations in accordance with the scope of the study to be made:

- Exploratory studies.
- Descriptive studies.
- Correlative studies.
- Explanatory studies.

According to Hernández Sampieri (2003), there are two factors that influence whether an investigation is initiated as exploratory, descriptive, correlative or explanatory: the current understanding of the research topic revealed by reviewing the literature, and the approach which the researcher intends to give to its study.

On the other hand none of the four types of study can be considered to be better than the others; all are equally valid and important.

After reviewing the literature existing on the subject, we found that there are similar studies, but in other contexts remote from the reality of the CUSUR, and from the reality currently experienced at the University of Guadalajara. The scope of the present research was conceived as an *exploratory study* that would allow us to analyze the teachers' perspective on the use of information technology in their educational programs.

b) Focus

The methodological approach followed in the research is mixed, with different techniques having been applied. On the one hand, there was carried out a document review to rescue some statistical data concerning the origin of the implementation of various technologies in the CUSUR, as well as an analysis of official documents: reports, development plans and curricula. For quantitative analysis, we designed a questionnaire which was applied to 42 of the 320 university teachers, 22 part-time, 16 full-time and 3 academic associates.

The stratified sample was not random, because, on the one hand, teachers were selected from 10 of the 13 programs existing in the Center, and on the other hand, included both those working with online courses and those who had no previous records of the use of technology. For the purposes of this study, the questions discussed were:

- Do you think that the technological infrastructure of CUSUR is sufficient to support teachers' demands? Why?
- Have you had enough didactic, methodological and technological support to implement ICT in your academic programs? Why?

- What was the reason why you implemented (or did not implement) ICT in your academic programs?
- Do you think that the teaching-learning process is modified by the implementation of ICT? Why?

Based on these questions and the answers the teachers gave, we obtained various categories of analysis in each; these are presented in the results section.

The method of participatory-action research guided much of the investigation, since the work involved simultaneous knowledge and intervention, and also involved the participation of the people involved (teachers and researchers) in the research program. Thus, we worked directly with teachers interested in introducing new forms of action through the use of technologies, not with those who just wanted to remain mere observers of what was already established. This phase of work is done based on the responses obtained with the application of the instrument, and as already mentioned, with a group of volunteer teachers.

At this stage, there were offered several short courses on the use of some technologies such as Internet, email and videoconferencing, and how to integrate these into the teaching process.

Results

The results obtained are presented here, according to the four areas identified above:

- Technological infrastructure.
- Support and teacher training.
- Reasons for the implementation of technologies.
- Changing the teaching/learning process.

With reference to each of these points there will given some of the conclusions shown by direct work with the group of teachers who participated in training courses, and who were part of the action/ research process.

Technological infrastructure

The question used in addressing this priority was, "Do you think that the technological infrastructure of the CUSUR is sufficient to support the teachers' demands?" Two choices were offered: *yes* or *no,* and included both the technological equipment as well as the physical spaces that contain it: laboratories, specialized classrooms for audio and videoconferencing, and self-access classrooms. As a result, 59.5% of the teachers considered it to be sufficient, while 40.5% believed it is not. It should be noted that within this second group, most are part-time teachers, who do not have a defined physical space or computer equipment for personal use; this has caused inconvenience and dissatisfaction within the University Center.

The second part of the question asked why they thought so. The categories of analysis resulting from the responses of teachers in this section are shown in Table I.

Table I. Technological infrastructure

Category	%
Computer equipment insufficient	16
Physical spaces insufficient	23
Both (equipment and spaces) sufficient	47
No answer	13

As already mentioned, although the CUSUR has eight laboratories equipped with 40 computers each, these spaces are for use by course instructors and students. The library has seven cubicles equipped for working, but this is not enough to meet the demand.

The lack of space and equipment has been a constant complaint, and the authorities have thought of creating specific spaces for course instructors. Because this group of teachers has participated actively in the training processes; in the design of online courses; and the implementation, in general, of information and communication technologies, thought has been given to some way of repaying their work, although this has not been carried out institutionally. By agreement of the administration, teachers who are giving online courses can suspend their in-and-out registration[3] as long as they prove their constant participation in the platform. Another incentive consists of payment for Internet service in the homes of those teaching online courses, as well as providing computers specifically set aside for those giving online courses. With these measures, the lack of physical space and technological infrastructure has been partially overcome.

Support and teacher training

For this area, we used the questions, "Have you had enough didactic, methodological and technological support to implement ICT in your academic programs? Why?"

Like the previous question, it consisted of two parts, the first answered with a *yes* or *no*. As a result, we found that 62% of the teachers considered that they have indeed had the necessary support in all areas, while 26% thought they had *not*. Twelve percent said they had not asked for such support. For the second part of the question, the categories of responses were divided into *strengths* and *weaknesses* (see Table II).

Table II. Strengths and weaknesses

Strengths		Weaknesses	
Category	**%**	**Category**	**%**
There have been offered various refresher courses related to the use and management of technologies, including methodological aspects for their implementation in academic programs.	34.6	There is an excessively-heavy workload, which impedes entering other areas, even for the benefit of the academic programs.	31.25
Technical support has been obtained when required.	27	Teachers do not know that there are different technologies they can apply in their academic programs, so have not asked for support.	12.5
Both of the above.	38.4	Teachers expressed little interest on their part; knowing that there are other possibilities for teaching and learning, they do not move toward them.	25
		This group did not answer the second part of the question.	31.25

In this area, we realize that most of the teachers have had the support required for the best use of the technologies; the teachers recognize the training effort the Center is making. However, the other percentage shows that it is necessary to consider the teachers' work load when encouraging them to expand the use of technology and to take advantage of the services offered. Once again there prevails a dearth of incentives for those who have shown interest in their training process.

It is noteworthy that some of the teachers who indicated they were unaware of courses and workshops offered at the Center, participated in the training group, and most already have some of their courses online. This has been a strength, since although progress in training has been slow, it is creating a culture oriented toward encouraging teachers to get acquainted with some technology and to introduce it into their academic programs.

Reasons for implementing ICT

For this area there was presented the question, "What was your reason for implementing (or not implementing) ICT in the academic programs?" The categories derived from responses to this question are shown in Table III.

Table III. Motives for using ICTs

Category	%
Personal Interest	14
Improve the student's training	36
Because of the modality of the academic program	12
Ignorance	21.5
Lack of time	7
Did not answer	9.5

As we can see, the answers the teachers gave match the previous area, where two of the reasons for not implementing ICT are the lack of time, and not knowing about the CUSUR's project for introducing technologies.

On the other hand, we had a large group of teachers who believe that implementing the technologies could help improve students' education. This consideration is vital because it gives teachers a motive strong enough to bring about change. Furthermore, we must not ignore the fact that teachers are more receptive if the message comes from their peers. Thus, the larger the group convinced as to the benefits of implementing technologies in their academic programs, the easier it is to convince others to become involved in that change.

Modification of the teaching-learning process

The question for this area was, "Do you think the teaching-learning process is modified after the implementation of ICT? Why?"

In the first part of this question, 41 of the 42 teachers said that *yes,* the teaching-learning process was changed, and only 1 teacher said *no.* For the second part of the question, the responses obtained were classified in five categories (see Table IV).

Table IV. Modification of the teaching/learning process

Category	%
Teachers are induced to update.	19
There is a change in times and spaces	17
Student self-teaching is induced.	14
New ways of learning are induced.	38
Said they did not know.	12

This last table shows that most of the teachers are aware of the change that technologies can bring about in the teaching process. The emphasis on new ways of learning and the need for an update in teaching put teachers in a situation of obligation, search and continuous integration. In this sense, Epper and Bates

(2004, p. 17), note that the last national teacher survey, conducted by the Higher Education Research Institute at the University of California, Los Angeles (UCLA), found that 87% of teachers believed that the use of computers improves student learning. As we can observe in the data presented here, teachers do not that this process can bring about improvement, but they still have many uncertainties as to how they can achieve it.

Conclusions

In this work we have seen how teachers have been active in the process of introducing ICT in academic programs. Many are already aware of their students' needs for new training, and of the skills they themselves must develop in their pupils if these are expected to have a smooth integration into the productive activities of society. However, even when the introduction of large numbers of computers has been a constant in the CUSUR, this has not been reflected in a higher quality of education.

In order to see concrete results in the students' training, teachers must be consistent in their own training, especially because they not only have to attack the technological front, but also must advance in their area of expertise—this being because knowledge is much less static than it was only five years ago. Thus, labor demands are multiplying, and if the administration is not aware of that, the whole burden falls on the teachers themselves.

Although there has been a major effort to expand the use of technology, the South University Center still has no institutionalized program for training, nor one for integrating technology. This has led to a great loss of energy and time, particularly because it sometimes is the administrators themselves who backpedal on what has been achieved.

The group of teachers involved in the action/research process had the opportunity to make significant changes in their teaching processes, and are now more aware that change will come about over several school years, not immediately.

Another point that has been worked on, is that of support among the members; since those who are more advanced have helped in giving advice to their peers, and have encouraged others to enroll in courses offered at the Center. This interaction among peers has been one of the key elements in producing the current results.

From all this, we conclude that the teachers are a group of summary importance in educational institutions. With support, incentives (which do not always have to be financial) and openness to change, they will constitute the primary elements needed for elevating the quality of the teaching and learning processes.

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[1] See Human Development Reports published annually by the United Nations Development Programme (www.onu.org).

[2] The *metropolitan area* of the state is made up of the municipalities of Guadalajara, Zapopan, Tlaquepaque, Tonalá and Tlajomulco.

[3] In the South University Center, as in many universities in Mexico, both part-time and full-time teachers are required to register their entry and exit of the facility. In this case, it is accomplished through a system of fingerprint identification.