

Development of ICT competencies in upper secondary education teachers at the UAN**Desarrollo de competencias TIC en profesores de educación media superior de la UAN**

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Abstract

Resumen

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Introduction

With the evolution of the internet and information and communication technologies (ICT) in the last decade, new trends in technology-mediated learning have emerged. On the other hand, students have grown up with technology around them, which has resulted in them relying on it for any academic activity. This has forced the creation of new teaching modalities, so that traditional teaching is no longer the only feasible one; distance education and blended learning (b-learning) have positioned themselves as new teaching models. Likewise, the democratisation of information has allowed the emergence of Massive Open Online Courses (MOOCs), as well as the emergence of Educational Platforms or Learning Management Systems (LMS), and new teaching approaches such as Flipped Learning and its practical application called Flipped Classroom.

The use of ICT in Higher Secondary Education is a topic that has been investigated by several authors, who state that despite the fact that the use of ICT is proven to benefit students in various ways such as: motivation, availability of materials and activities, increased productivity, improved comprehension, among others; teachers have not generally been trained and few do so, so that the impact they cause is low (Bauer and Kenton, 2005; Cuban and Krikpatrick, 2001; Kozma, 2003; Robertson, 2003).

According to documents from the United Nations Educational, Scientific and Cultural Organisation (UNESCO), by 2016 a strategy for the integration of Information and Communication Technologies (ICT) in the teaching and learning process will be applied at a global level; this would allow universal access to education, greater equality of instruction, more effective teaching, and promote the professional development of teachers, among other factors that affect the educational development of a school, a region or a country. (UNESCO, 2016).

It is important to have trained teachers with knowledge and competences in Educational Technology in order to achieve meaningful learning through Virtual Learning Environments (VLE) that are available to students anywhere and at any time, materials and learning activities.

Content

This project aims to contribute to the development of ICT competences of teachers of Secondary Education of the Autonomous University of Nayarit, through a training programme focused on the use of new technologies such as the transparent whiteboard (Cristalboard) for the creation of dynamic video tutorials; the editing and production of audio, sound and video for the creation of multimedia materials; the creation of interactive multimedia activities, such as crossword puzzles, word searches, infographics, timelines, quizzes, and others; as well as the design of activities and evaluations of the courses they teach with the help of a virtual learning environment.

The project was planned in 3 stages: 1) the first one corresponds to a diagnosis to find out the ICT competences of the teachers, 2) the second one corresponds to the training of the teachers, and 3) the third one corresponds to the application of a similar instrument to measure the degree of knowledge and use of technological applications and tools for their use in the teaching-learning process.

Methodology

Stage 1. As part of this stage, an instrument was applied to measure teachers' ICT competences. The sample selection criterion was the total number of participants in the training course at the UAN's Upper Secondary Academic Units in the northern area. The instrument applied to the focus groups consisted of 60 online questions.

The type of study was mixed. In this research, emphasis is placed on the quantitative part and contrasted with the qualitative results in order to achieve a better understanding. A total of 28 teachers participated. Of these, 16 were female and 12 male.

The quantitative instrument was oriented towards the identification of learning scenarios. It comprises ten items that focus on reviewing the characteristics of the discussion groups, covering aspects such as personal data, access to technological media, time spent on the Internet and PC, information management, content management, communication, computer security, problem solving, collaborative work and perception of ICT.

The qualitative tool used was that of teacher discussion groups, belonging to each of the participating academic units.

Stage 2. In this stage, the results obtained from the surveys were analysed to identify the strengths and weaknesses in the ICT competences measured, with the aim of designing the courses to be taught and registering it as a Diploma course with the Directorate of Teacher Development.

The diploma course was organised in 4 modules, each with a duration of 60 hours for a total of 240 hours of training, of which 120 would be face-to-face and 120 of platform work; due to the health emergency of Sars Cov 2, it was given completely remotely.

Stage 3. At the end of the training, an instrument was applied to find out the teachers' perception of the courses. During the diploma course, the high school teachers carried out various activities to measure the knowledge and skills acquired in each subject taught.

At the end, the data and information obtained were analysed in order to present the results and draw conclusions regarding the project carried out in the three high schools in the northern part of the state of Nayarit.

Results

The instrument applied to the focus groups was composed of ten categories, covering aspects such as personal data, access to technological media, time spent on the Internet and PC, information management, content management, communication, computer security, problem solving, collaborative work and perception of ICT.

An analysis was carried out with information obtained through an instrument that was applied to teachers of the academic preparatory units numbers 2, 9 and 12 of the U.A.N., 28 teachers participated, 43% were men and 57% women, in this study it is important to mention that 93% of the teachers have a bachelor's degree and the remaining 7% have a master's degree; on the other hand, 46% of the participants have 10 to 15 years of experience in university teaching.

Once the instrument was applied, the most relevant questions were grouped into 4 categories: a) information management, b) content management, c) communication and d) collaborative work.

Information management

This category included questions related to knowledge and use of internet browsers, file storage and management, and cloud storage.

Below are three tables that represent the results of the pre-test and post-test in percentage of the information management category.

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 7% | 7% | 0% | 0% |
| Little | 18% | 14% | 7% | 7% |
| Medium | 50% | 32% | 43% | 43% |
| High | 25% | 47% | 50% | 50% |

Table 1 Percentage of knowledge and use of internet browsers

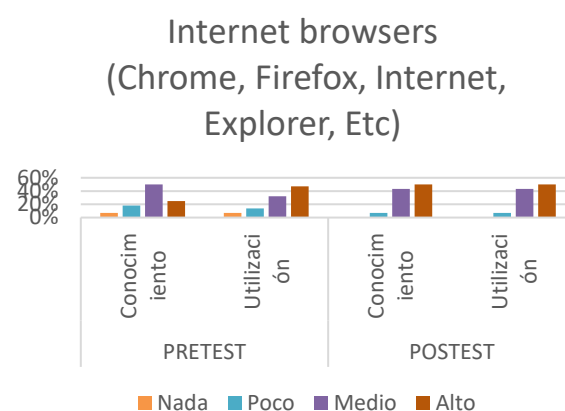


Figure 1 Graph of knowledge and use of internet browsers before and after the course

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 25% | 25% | 0% | 0% |
| Little | 14% | 21% | 14% | 7% |
| Medium | 40% | 25% | 36% | 43% |
| High | 21% | 29% | 50% | 50% |

Table 2 Percentage of knowledge and use of storage and management of files and contents

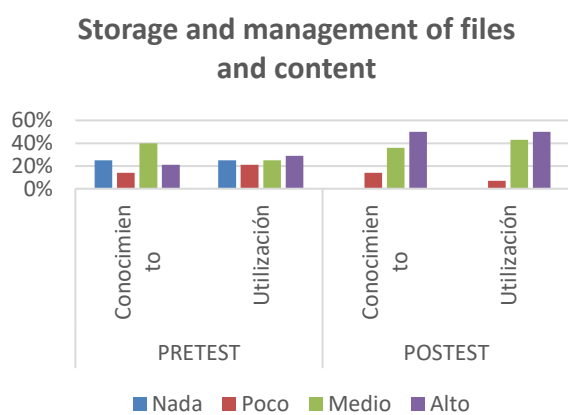


Figure 2 Graph of knowledge and use of file and content storage and management before and after the course

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 43% | 57% | 7% | 14% |
| Little | 21% | 14% | 0% | 0% |
| Medium | 18% | 11% | 57% | 64% |
| High | 18% | 18% | 36% | 21% |

Table 3 Percentage of knowledge and use of tools for storing files on the cloud

Content management

The content management category included questions on knowledge and use of infographics and timelines, online quizzes and assessments, and multimedia presentations.

The following 3 tables represent the degree of knowledge and use of content management applications.

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 39% | 39% | 0% | 7% |
| Little | 21% | 32% | 7% | 14% |
| Medium | 32% | 21% | 29% | 22% |
| High | 7% | 7% | 64% | 57% |

Table 4 Percentage of knowledge and use of infographics and timelines

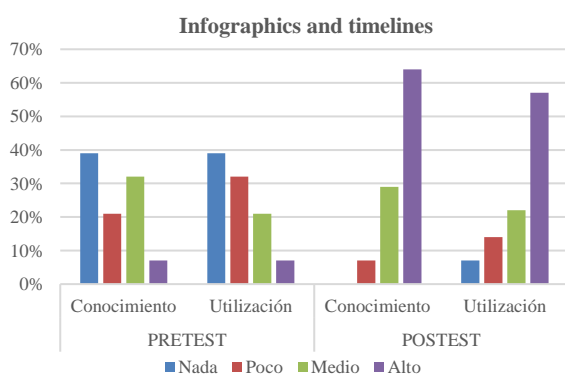


Figure 3 Graph on knowledge and use of infographics and timelines before and after the course

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 57% | 64% | 0% | 7% |
| Little | 14% | 11% | 7% | 7% |
| Medium | 21% | 18% | 22% | 14% |
| High | 7% | 7% | 71% | 71% |

Table 5 Percentage of knowledge and use of quizzes and online assessments

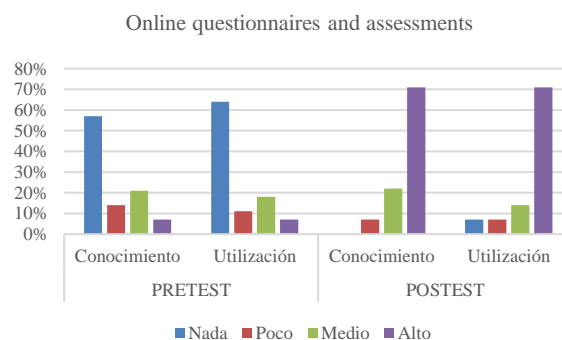


Figure 4 Graph on knowledge and use of online questionnaires and assessments before and after the course

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 21% | 18% | 0% | 0% |
| Little | 7% | 18% | 7% | 7% |
| Medium | 68% | 50% | 43% | 36% |
| High | 4% | 14% | 50% | 57% |

Table 6 Percentage of knowledge and use of multimedia presentations

Communication. The communication category made it possible to collect information related to the use of e-mail, chats and collaborative documents.

In this sense, 3 tables are presented on the degree of knowledge and use of synchronous and asynchronous communication applications.

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 4% | 7% | 0% | 0% |
| Little | 7% | 21% | 0% | 0% |
| Medium | 39% | 25% | 21% | 21% |
| High | 50% | 47% | 79% | 79% |

Table 7 Percentage of knowledge and use of electronic mail

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 21% | 32% | 0% | 0% |
| Little | 21% | 29% | 0% | 0% |
| Medium | 25% | 11% | 43% | 50% |
| High | 32% | 32% | 57% | 50% |

Table 8 Foreknowledge transfer and the use of synchronous communication software (chats, chat rooms, etc.)

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 39% | 47% | 0% | 7% |
| Little | 29% | 32% | 21% | 14% |
| Medium | 25% | 18% | 43% | 36% |
| High | 7% | 4% | 36% | 43% |

Table 9 Percentage of awareness and use of collaborative documents

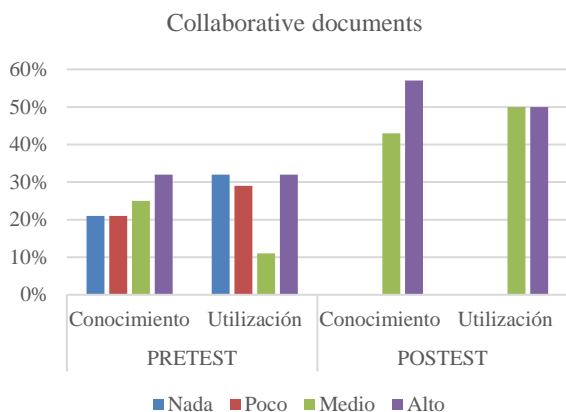


Figure 5 Graph on the knowledge and use of collaborative documents before and after the course

Collaborative work. This category examined the degree of knowledge and use of applications for collaborative work, such as Google Docs, the cloud, and educational platforms.

Finally, the fourth category of collaborative work made it possible to investigate the degree of knowledge and use of applications and tools for collaborative work. Below are 3 tables of the category:

Table 10 Percentage of knowledge and use of Google Docs

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 50% | 60% | 0% | 7% |
| Little | 36% | 29% | 0% | 7% |
| Medium | 11% | 7% | 36% | 29% |
| High | 3% | 4% | 64% | 57% |

Table 11 Percentage of awareness and use of the cloud (Dropbox, Google Drive, and Onedrive)

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 43% | 58% | 0% | 7% |
| Little | 18% | 14% | 14% | 7% |
| Medium | 35% | 14% | 36% | 43% |
| High | 4% | 14% | 57% | 43% |

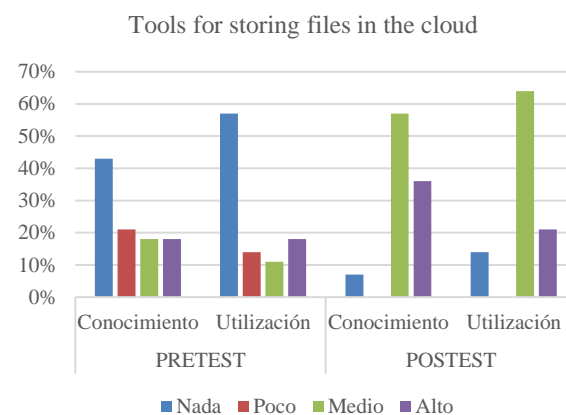


Figure 6 Graph on the knowledge and use of tools for storing files in the cloud before and after the course.

| Frequency | PRETEST | | POSTEST | |
|-----------|-----------|-------|-----------|-------|
| | Knowledge | Usage | Knowledge | Usage |
| None | 29% | 47% | 0% | 0% |
| Little | 39% | 29% | 7% | 14% |
| Medium | 21% | 11% | 36% | 50% |
| High | 11% | 13% | 57% | 36% |

Table 12 Percentage of knowledge and use of educational platforms

Conclusions

From the results obtained, it is important to point out that teachers are aware of many of the ICTs applied to education, but when asked about their application, the percentage drops considerably. Whether it is about information management, content management, or the use of ICT applications and resources, most of them answered that they do not use them, they only know about them.

The questions asked in relation to communication show that teachers currently make constant use of synchronous and asynchronous communication applications, such as Whatsapp, Facebook Messenger and e-mail. However, the use of forums is not a common practice among upper secondary teachers.

One of the categories that have attracted the most attention is that of applications and resources for collaborative work. The knowledge and use they make of them is very low, which reflects the lack of ICT competences in this aspect, and which results in the lack of creation of collaborative activities with students. This is presumably due to the fact that the modality of the high schools surveyed is face-to-face, and therefore, the use of collaborative tools is not indispensable, since these activities are carried out in the classroom.

The training provided through the diploma course, based on the results of the initial instrument to determine the ICT competences of the teachers, was initially designed for a blended mode (B-Learning), however, due to the health contingency, it was changed to the distance mode, and it was also necessary to modify the contents of the modules to adapt them to the needs that were created at the time of the pandemic. Some of the most important changes were the inclusion of topics related to distance learning applications such as Google Meet, Classroom, Zoom, and Edmodo. This resulted in teachers being trained in advance to use some of the educational platforms for distance learning classes.

From the information analysed, it can be affirmed that ICT applied to education is currently important in order to offer diversity and versatility in the classroom. In this sense, the teachers who took the online diploma course have stated that they have enjoyed the contents covered in the course, and that they are willing to continue training in the use and application of educational technology tools.

For the work team it has been a very enriching experience, due to the fact that the distance learning modality with the teachers who took the diploma course was addressed without having foreseen it. The fact that they were not prepared for the distance learning modality meant that they had to work harder than expected to adapt the activities to the new modality.

The current health contingency has meant that teachers have been encouraged to train in educational technology in order to use an educational platform as the basis for the organisation and administration of the content to be taught. It is also important to recognise the teachers who took the diploma course, as they were adequately prepared for the health contingency.

Finally, it can be concluded that the training of teachers in educational technology is necessary to be prepared for any situation that may arise and require them to teach at a distance. In this sense, it can be affirmed that knowledge in educational technology and the development of ICT competences in teachers has become indispensable, now more than ever, and we do not know what the future holds, so it is better to be prepared in the development of these competences in education and technology.

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