



Improve Teaching-learning Processes for Computer Systems Engineering of the Courses in Distance Education in TecNM

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Authors' contributions

This work was carried out in collaboration among all authors. Author MH designed the study, wrote the preliminary protocol and recorded it as an educational research. Author BR carried out the statistical analysis of the data collected, as well as its interpretation and redact conclusions. Author CJ advised on the design of the data collection instrument and managed literature the searches. Author DO apply data collection instruments. Author JO captured the information for the results. All authors reviewed the literature and approved the final manuscript.

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ABSTRACT

In the Technological National of Mexico in San Luis Potosí (TecNM of SLP), Studies in computer systems in Engineering are taught, with a distance education model. However, it is detected that sometimes some classes are lost, which implies little effectiveness of the model. In the present study, a collection of data on connection effectiveness was carried out, to propose a reinforcement in the courses taught. Teachers were surveyed between January 2018 and December 2018, for each session and the results showed that 96.42% of the sessions were connected and were of

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good quality. Even so, it was proposed the realization and use of virtual courses to which the students could have asynchronous and timeless access, as an extra support, in case the students do not attend the campuses, they want to return to the class to clarify any doubt or review the class for preparation of practical work or evaluation.

Keywords: Virtual courses; Technological National of México in San Luis Potosí; Virtual education Model (VEM); Distance Education (DE).

1. INTRODUCTION

At the beginning of the third millennium, appears the Virtual Education Model (VEM), based on the paradigms of behaviourism, cognitivism, social constructivism and connectivism, Its purpose to expand the coverage of access to education to sectors of the population, that for some cause (work, incapacity, isolated or marginalized area, etc.) they cannot physically move to educational institutions and thereby improve the quality of education for the population. This model makes use of information and communication technologies (ICTs), as a means to develop the teaching-learning process.

At the 1990 conference, the United Nations Educational, Scientific and Cultural Organization (UNESCO), [1] sets out the objective of the Distance Education (DE) modality for Latin America, which is to contribute to the achievement of the goals of improving the quality of education in Latin America and the Caribbean.

The National Technological of Mexico [2], in the challenge of providing higher-level education in the school modalities, not schooled remote and mixed, establishes the framework of reference and systemic operation, methodologically supported, flexible and ICT-supported, which encourages the student to self-manage and account for his or her learning process.

During the 2014-2015 school year, the enrolment of TecNM's Distance Education (DE) and Mixed Education (EM) modalities was 11,405 students, staffed by 1,500 teachers. Currently offering 10 undergraduate level curricula in the non-school model and at the TecNM of SLP, in 2018 only 2 of these plans were offered: Industrial Engineering and Computer Systems Engineering. It has the necessary infrastructure and the use of the Moodle educational platform. With DE, TecNM contributes to reducing the digital divide, strengthening inclusion, equity, diversity; and to take Mexico's higher-tech education to international arenas, from a national stage to a global one [3].

According to the promises of the current government, the advisor on telecommunications: Abel Hinber Sanchez, said it aims to increase broadband coverage to connect the more than 50 million compatriots who still lack the service [4]. These initiatives aim to generate inclusion of various items, especially in education and providing service individually, through a Shared Network, and not only in public places. If this promise was to be fulfilled, virtual courses would be very useful as students could connect from home, at any time possible, to access those courses so that they can perform the tasks or collaborative work requested and only would need to own a computer, tablet or cell phone, as Internet access would be free.

2. MATERIALS AND METHODS

This is an exploratory investigation since an attempt was made to explain the quality and frequency of the connection. Furthermore, it uses, and descriptive analysis, as it showed the real situation of the quality and frequency of the connection.

The frequency is defined by the Rioduero Dictionary of Mathematics [5] as the number of times the event occurs within the total events, it is customary to use histograms to visualize such behaviour and frequency analysis is a procedure used to estimate the probability of an event occurring. According to Hernández, [6] these types of research should be conducted using analysis and synthesis on the data collected through the following information collection tool: Log, where indicated by day, campus and subject matter taught, if any connection, the quality of the connection (audio and video) and the quality of the reception.

Virtual courses, which students may have asynchronous and timeless access to, would be recommended as extra support, in case students do not attend campuses or wish to resume class to clarify any doubts.

The data collected in the connection log correspond to 437 hour-class-connection, were

answered by teachers in 51 different subjects, throughout 4 quarters, whereby a quarter consists of 8 weeks and covers 3 months, namely, (January-April 2018, April-July 2018, August-October 2018 and October-December 2018) of a total of 2,040 hour-class-connection. The subjects are related to the career program and the English language. Each quarter lasts 8 weeks, a total of 40 hours per subject. Results are reported in Table 1.

Table 1. Subjects and total hours per quarter period

	Dates	Subjects	Total hours
1	January 29 to March 23	19	760
2	April 9 to June 1st	7	280
3	August 27 to October 19	11	440
4	October 22 to December 14	14	560
	Total	51	2040

Note The total hours per quarter period = No. of subjects x No. of weeks [8] x 5 hrs/week

The results showed that the hour-class is almost entirely exploited.

Fig. 1 shows that the percentage of sessions in which no connection is established is minimum, only 3.58%. No connection times causes are because there is no power supply or Internet connection on campus.

Other results show that the campus with the highest percentage of offline sessions is El Naranjo, followed by Xilitla and finally Ahualulco (see Fig. 2). The Ahualulco campus is the closest campus to the city of San Luis Potosi. This proximity can influence to have a better connection. The El Naranjo campus has problems with its connection antenna and on the Xilitla campus, the weather conditions are very different from those of the other campuses.

The percentage of sessions in which the teacher does not use the video option is related to the delay of communication. The option to have a session with video is almost not used because it makes the connection much slower. Results are depicted in Fig. 3.

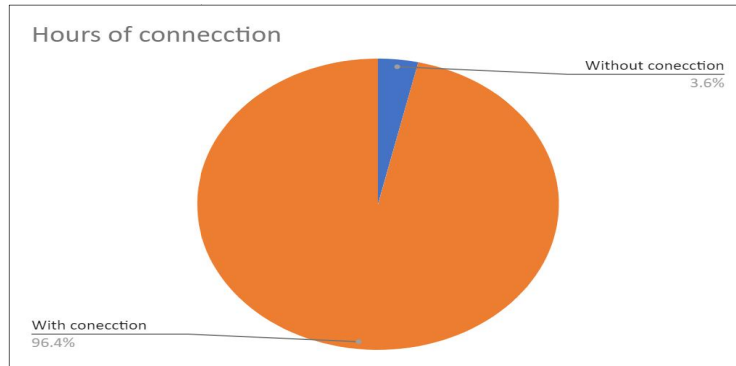


Fig. 1. Hours of connection

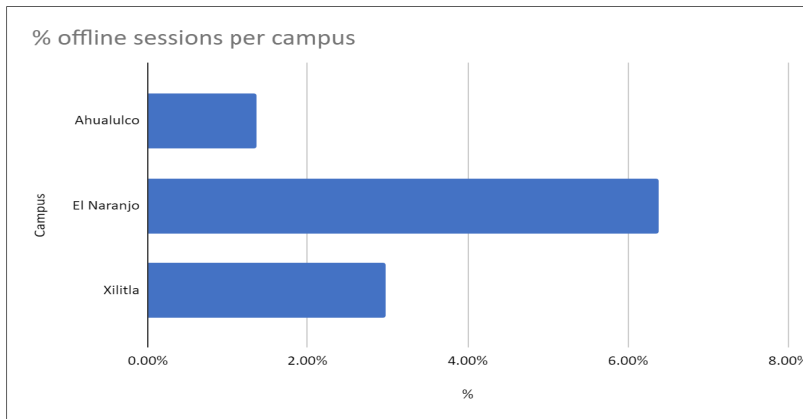


Fig. 2. Percent offline, sessions per campus

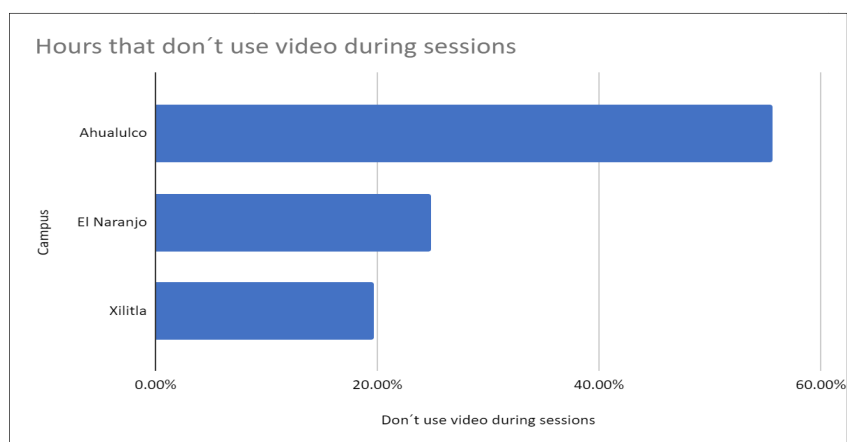


Fig. 3. Percentage of no video usage during sessions

3. RESULTS AND DISCUSSION

It was expected to demonstrate that the connection frequency was very low. Which was not what the results yielded, as the connection was established in 96.42% of the sessions. On occasions when the connection was not made was due to lack of power supply or Internet connection on campus.

About the quality of communication (audio and video), the results showed that the audio is normally established when there is a connection and that the video signal is not enabled by 33.41% on the average of the teachers since it decreases the signal quality and makes more than one transmission process by consuming a lot of bandwidth.

According to Chehabeddine & Hejase [7], E-learning can occur in or out of the classroom. It can be self-paced, asynchronous learning or may be instructor-led synchronous learning. Therefore, in this research, virtual courses, which students may have asynchronous and timeless access to, would be recommended as extra support, in case students do not attend campuses or wish to resume class to clarify any doubts.

The aforementioned is in line with Posinasetti [8] who contends that e-learning reduces travel time and travel costs for off-campus students. Furthermore, students may have the option to select learning materials that meet their level of knowledge and interest. Finally, this research shows that virtual hour-class is almost entirely exploited.

4. CONCLUSION

The Ahualulco campus is the closest campus to the city of San Luis Potosi, this can influence to have a better connection. The El Naranjo campus has problems with its connection antenna and on the Xilitla campus, the weather conditions are very different from those of the other campuses.

The results were surprising in connection. However, one should consider the effectiveness in the delivery of the topics, the resources used such as software, hardware, virtual machines, simulators, servers, etc. These resources consume bandwidth and sometimes cannot be executed for the teaching-learning process; as well as the channels of communication and teaching towards the students.

Virtual courses, which students could have asynchronous and timeless access to, would be recommended as extra support, in case students do not attend campuses, wish to resume class to clarify any questions or review the class to prepare for practical work or evaluation.

CONSENT

As per international standard Informed and written participant consent has been collected and preserved by the authors.

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COMPETING INTERESTS

Authors have declared that no competing interests exist.

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