

## Application of Information and Communication Technologies for the Search of Scientific Information in the Postgraduate of Medical Specialties

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Received: January 24, 2020; Published: February 27, 2020

### Abstract

**Introduction:** Graduate students of medical specialties require the use of additional resources than those traditionally used to search for scientific information. The general objective of the study is to propose the use of Information and Communication Technologies (ICT) to improve the search for scientific information; Specifically, with the application of Boolean search engines.

**Material and Method:** A mixed qualitative/quantitative study is presented. The following measurement instruments were applied in the study. Survey, questionnaire and field study.

**Results:** It was observed in the results, that 60% of the students, accept the TIC, as tools of support for the search of scientific information. 40% of the students identify the usefulness of the Boolean search engines. Forty students participated in the field study; In a data collection sheet, information was captured from each student and the two procedures were used, the usual one - the student, and the Boolean search. These results were analysed using the Chi Square ( $X^2$ ) statistical index.

**Conclusion:** The use of Boolean search engines, is ideal, easy to apply and requires less time. More appointments are obtained, and these are more select, which improves the search for scientific information.

**Keywords:** *Information and Communication Technologies; Boolean Seekers*

### Introduction

There are several definitions of Information and Communication Technologies (ICT), one of the most complementing its content is the following: "they are the set of processes and products derived from the new tools hardware and software, which are information media and communication channels related to the storage, processing and digitalized transmission of information".

García Montes M [1], makes a pedagogical reflection that is interesting, where he describes the change of paradigms - from behaviorist to constructivist and cognitive - when using ICT in the educator and educator. Contemplate educator activities as a guide and facilitator, by providing resources and tools they need to explore and develop new knowledge.

Jiménez-Pernett [2], describes the role of new technologies, mainly with the use of the Internet, in health and wellness training and information. He attributes that this is a knowledge of continuous expansion and affirms the author, that we are facing a revolution in the way in which the various actors of the health system seek and find medical information, which is why ICTs are a tool of necessity in the health area.

Other authors such as Pruneda-Figaredo [3] refer in their analysis, that ICTs facilitate the realization of works by the way of obtaining information. They also comment that these technologies offer the following: a) access to all types of information; b) all types of data processes, quickly and reliably and c) immediate, synchronous and asynchronous communication channels, to disseminate information and contact any person or institution in the world.

The field of application of ICT extends to another type of intervention such as pedagogical support. Méndez-Estrada [4] and his work group, carry out a study where they intend to determine, if the use of ICTs in a broad sense, allows dropping out of school in a graduate school and that this intervention increases its quality and bonding with the needs of society. The authors conclude that, with the use of ICTs, the teaching processes are supported and reinforced, which decreases attrition and favors the link with society.

Graduate students of medical specialties require the obtaining of scientific information to carry out a large part of the assistance and cognitive activities, which are according to each area of performance; For this purpose they have the following alternatives: a) access and consultation to printed scientific journals b) access to Information and Communication Technologies (ICT), with the use of search engines and search engines, for which the student does not need to go to libraries, all Once you can access from a laptop.

### Definition of the problem

The conjunction of this tool (ICT), will be more useful to students, since they can simplify their activities through a formal procedure to search for information. With this practice, the daily and asystematic intuitive search is omitted, which makes the application of this support tool difficult. Its proper use - use of the Web and the application of Boolean search engines - will give order and systematize the search for scientific information. This represents for the student, obtaining a greater amount of bibliography, discriminating against it and classifying the best level of scientific evidence.

The following question follows from the foregoing: Can the procedure for obtaining scientific information, based on Information and Communication Technologies in postgraduate students in medical specialties, be improved?

### Objective of the Study

- **General objective:** To propose the use of ICT to improve the obtaining of scientific information in postgraduate students of medical specialties.
- **Specific objectives:** a) Determine the level of mastery of the students who use the Web; b) Describe the characteristics of Boolean operators and apply them in the search for scientific information.

### Materials and Methods

The structure of the research study has characteristics of mixed research; qualitative/quantitative Cohort, open assignment, transversal and prospective. The inclusion criteria for the study were:

- a) Postgraduate students of medical specialties of the Tepic Civil Hospital, Nayarit; Dr. Antonio González Guevara;
- b) Students of any grade level.
- c) Who accepted the study procedures in writing.

The elimination criteria were for students who did not apply the three measuring instruments.

### Method

The work is focused on the application of a questionnaire, a survey in which items are selected, with a qualitative study base at the beginning and then the results of non-parametric variables are analyzed, using Chi Square. Our methodology has a design similar to the proposal of Fernando Conde [5], which includes the two techniques; Qualitative and quantitative.

To give form to the proposed study, the procedures that were carried out in the elaboration of the technique or instrument, as well as the design for the information collection, were the following:

- a) A questionnaire is applied that aims to provide an estimate of the percentage of students who agree with the use of Information and Communication Technologies, to be applied in the search for scientific information. It is proposed to recognize if students agree to apply these types of tools.
- b) An interview is also applied, which was considered as an alternative procedure, and which was made up of eight questions, which are related to the use of ICT. The survey was applied to 40 students.
- c) The field work was carried out so that the study was better formed from the methodological point of view. The measuring instrument was applied in a single study group 40 students, which were considered as a convenient sample. The student was his same control. The following method was used: 1) the student sought information, using the procedure he usually uses and 2) the student in a second time, sought information using the Boolean Seekers as a tool. Variables such as: suitability of the procedure, ease of use, and the universe of citations found by procedure. These variables identified as non-parametric were analyzed by statistical analysis; Chi Square ( $X^2$ ).

The following are required for the application of Boolean search engines: 1) write the keywords and 2) write the search engine in the English language and in capital letters.

Table 1 and 2 describe Boolean search engines and their use.

Operator	Utility
AND	It serves to unite concepts
OR	It is used to sort the search terms according to the preferences, if few records are found
NOT	To delete a term
NEAR	Retrieves records that have both terms in the same field
" "	To decrease the number of results (full sentence)
( )	To join multiple searches into a single
* ?	To play with the family of terms. The question is placed in the middle of the word, the asterisk at the end
+ the -	Replacing OR or AND

**Table 1:** Application Boolean Finders (English and Capital Letters).

Question	Operator	Search terms
I need information on Laparoscopic Cholecystectomy	O (OR)	Cholecystectomy OR laparoscopic
I'm interested in adult dyslexia.	Y (AND) o (+)	Dyslexia + adults
I'm interested in radiation, but not nuclear radiation.	NO (NOT) o (-)	Radiation - nuclear
I want to learn about the side effect of Clonidine	O (OR) Y (AND) y(+)	Clonidine + side effect

**Table 2:** Application Boolean Finders (Examples).

**Results**

The size of the study population was considered a convenient sample of 40 students (N = 40), who were the graduate students who were performing their duties in each medical specialty of the following medical areas; anesthesiology, general surgery, gynecology and

obstetrics, internal medicine, integrated medicine and pediatrics. In answering the questionnaire, in a cognitive element it is observed that there are 90% of students who consider themselves capable of delivering the tasks when using the Information and Communication Technologies. In the behavioral and cognitive element; 100% of students value the use of ICT as a support tool and, above all, its use is easy to apply. The cognitive element: it was observed that 90% of the students manage the ICT to perform tasks and activities, in addition to surfing the internet to search for information. Behavioral element: Regarding the search for classified scientific information, 80% use ICT for this function, in addition to applying these tools in the search for problem solving. Cognitive element and behavioral element: The knowledge of the nomenclature that is required for the identification of ICT, 80% of students identify them and 20% do not know them. 100% of students refer to having access to the Internet. In the affective element indicator, it was observed that 90% students considered the importance of having computer skills to properly use ICT. Behavioral element: it is appreciated that only 50% of students are informed of the existence of training courses for the management of ICT, the remaining 50% ignore the existence of courses on the management of ICT.

The following results were obtained from the application of the survey: 60% (n = 24), of the total students accepted ICT as tools, to be used in the search for scientific information. 40% of the students (n = 16), accepted that they recognize the use of Boolean search engines, the rest of the students said they ignore them (Figure 1). The students mention (60%), know the computer resources that are available in their hospital, 40% of these students, are unaware of their existence. Regarding the methods that students use to search for scientific information; 40% exclusively apply the Internet and 60% use alternate methods, where it is included; Internet, magazines and Web pages of each specialty.

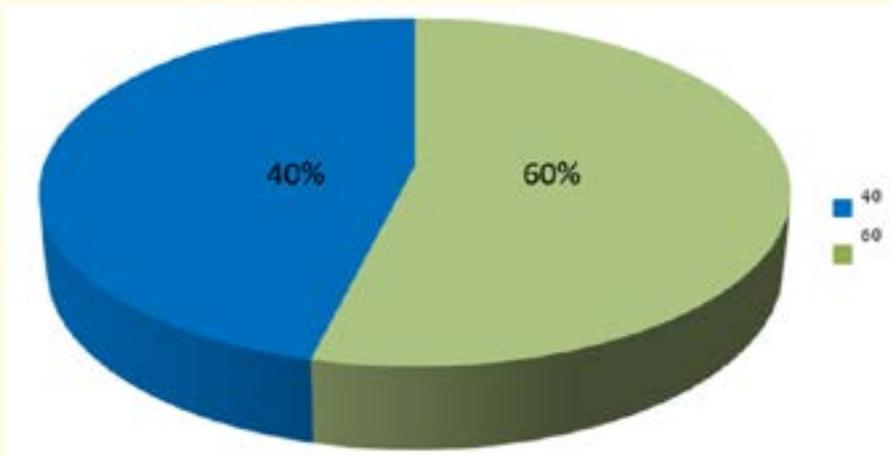


Figure 1: Identification of Boolean Finders 40% identify it.

In the Field Study, the measuring instrument that was applied to 40 students was randomly entered into the study, as described below: Four contingency tables were prepared two by two, analyzed by Chi Square ( $X^2$ ).

Table 3 show time used:  $X^2 = 99.642$  with 4 degrees of freedom  $p < 0.001$ . Critical value = 18.46. The figures fall outside the rejection zone. Which suggests that the use of search engines favors the search for scientific information, by reducing the time required.

Table 4 shows number of citations found.  $X^2 = 120,000$ , with 4 degrees of freedom,  $p < 0.001$ . Critical value = 18.46. The figures fall outside the rejection zone. The results suggest that the use of ICTs improves the search for scientific information, by providing more citations.

Time Used	More Time Value 1	Less Time Value 2	Total
Observed (Without search engines)	40	0	40
Theoretical (With search engines)	0	80	80
Total	40	80	120

**Table 3:** Time Used  $X^2 = 99.642$ . Critical Value = 18.46.  $p < 0.001^*$ .

Number of Appointments	More Quotes Value 1	Fewer Dating Value 2	Total
Observed (Without search engines)	0	80	80
Theoretical (With search engines)	40	0	40
Total	40	80	120

**Table 4:** Number of appointments found.  $X^2 = 120,000$  Critical Value = 18.46.  $P < 0.001^*$ .

Table 5 shows suitability of the Procedure.  $X^2 = 95,457$  with a critical value of 18.46,  $p < 0.001$  figures fall outside the rejection zone, suggesting that there is more suitability with the use of Boolean search engines.

Fitness	Yes Values 1	No Value 2	Total
Observed (without search engines)	5	35	75
Theoretical (with search engines)	40	0	40
Total	45	35	115

**Table 5:** Suitability of the procedure.  $X^2 = 95.457$  Critical value = 18.46.  $P < 0.001^*$ .

Table 6 shows ease of use of procedures.  $X^2 = 20,571$  with 4 degrees of freedom,  $p < 0.001$ . Critical value = 18.46. The figures fall outside the rejection zone. This result confirms that ICTs facilitate the search for scientific information.

Ease use	Yes Value 1	No Value 2	Total
Observed (without search engines)	30	20	50
Theoretical (with search engines)	40	0	40
Total	70	20	90

**Table 6:** Ease of use of procedures.  $X^2 = 20,571$ . Critical Value = 18.46  $P < 0.001^*$ .

In the results of the tables from number 3 to 6, it is observed that if there are statistically significant differences in each of the analyzed variables, when Boolean operators are used, as a tool in the search for specialized information. A better use is reported and with greater advantages than with the intuitive asystematic search method, which students usually use. Time is saved and more information is obtained to select the most appropriate one.

## Discussion

ICTs have a broad field of application in education; Moreno Chaustre., *et al.* [6], describe their contribution in the so-called knowledge society; enhance ways of thinking and acting, which must be focused on the problematic realities and strengths of the context. The authors

abound in the way of using ICT, as didactic support in the classroom, where the idea itself is transformed from a physical and closed place, to a socio-affective and open space. A place where a diversity of actors interact in the educational process; students, teachers, parents, managers, merchants, politicians, community leaders, etc.

From the results obtained from this study, the following are interpreted: The applied questionnaire was useful, since it allowed to identify that in the behavioral and cognitive element, there is a high percentage of students, who accept ICT as support tools for the delivery of tasks, to surf the Internet and also They consider easy application. A high percentage of students agree to use ICT for the search of scientific information and also report that it can be used to solve problems. In the behavioral element, 50% of students report that they lack information regarding training in the management of ICT, and these students also do not consider it important.

In the survey students accept (60%), the use of ICT in the search for scientific information, the remaining 40%, shows no interest in using this tool as support. It is also perceived in the survey, that only 60% of these students have knowledge of the means available in their hospital, for the search of scientific information; the other 40% ignore what are the bibliographic support alternatives that exist in their hospital unit.

This may be a reflection that there is a decoupling; between students and teachers, that is, in the teaching-learning process there is no such necessary communion, which is communication.

40% of students identify Boolean search engines as a procedure to search for information, the rest of students use alternative means. These results indicate that there is controversy in what they answered in the questionnaire and in the survey responses.

Regarding the relevance of doing the survey, Sánchez Carrión [7], points out the need to make a reflection, where these levels that are essential must be analyzed; The technical eye which does not doubt the relevance of this technique to study the subject in question and also, looks for the possible mistakes that have been made in its implementation. The methodological eye that performs its functions before the technical eye and wonders about the adequacy of the survey to the dimension of the object we are studying, in addition to looking at the relevance of the use of this survey.

We agree with what this author expresses, in our study we conducted a survey, which covers the levels described, however there is the possibility that there are attributable errors for not obtaining all the information, or that there are measurement errors where the interviewee Don't always say what you think. The field study allowed to identify the true tendencies of the students in the use of Information and Communication Technologies. In most students, there is a lack of knowledge of how the network should be used in the search for classified information.

In the structure of the present study, the observations of Álvarez-Gayou [8] were followed, in his study he presents a data collection instrument, which contemplates the following aspects; a) Reliability: the degree to which its repeated application to the same subject or object produces the same results and b) Validity: the degree that the instrument measures the variable, which you really want to measure.

Both points were considered in the study. In the field work, the student was allowed to have an active participation in the application of the procedures, which is why he agrees with what is described by the author in his document describing; How to do qualitative research.

Castillo E [8] points out that the methodological rigor of a qualitative investigation is represented by several criteria, which must be respected promptly and are the following: a) credibility; it is achieved when the findings of the study are recognized as real, by the people who participated and who have been in contact with the investigated phenomenon. b) confirmability; which is the neutrality of the interpretation or analysis of the information that is achieved, when another researcher can keep track of the original investigator and arrive

at similar findings. c) transferability; that it is the possibility of transferring the results to other contexts or groups; that is to say that the methodology can be extrapolated to be applied in another study population.

In our study it was determined to apply what described by Castillo [8] the three criteria mentioned were processed; The methodology used allows to extrapolate and apply these results in another educational context, that is, the study can be considered to have external validity (term used in quantitative research).

Given these fundamentals, the study presented was considered to include in the qualitative methodology, triangulation, as described by Zapata [9] was included; the questionnaire, the interview, the observation and the field study. These strategies allowed validating the data, and it was considered that the data obtained were adequate and that it coincides with the instruments used.

Lorenzo [10] points out that there are different types of tools for searching for information through the network, so he proposes the following: search engines based on directories or indexes, free text search engines, natural language search engines, and meta or multi search engines.

The author points out that it is not convenient for each researcher or each professional to use an excessively high number of sources of information, it is recommended that the user choose which of these tools fits their needs. The author also notes that it is more convenient for them to systematically know and apply a single tool for the search of scientific information, such as Boolean search engines, which are suitable for this purpose and easy to apply; with the advantage of obtaining according to each criterion, the number of appointments according to academic needs.

According to the criteria of Ramírez García [11], Boolean search engines are used as search engines on the Internet and can be manifested in three different ways: a) Boolean logic complete with the use of logical operators. Many of the complete Boolean search engines, which requires the use of logical operators; b) implicit Boolean search with keyword search. It refers to the type of searches in which the terms that represent the concept to be retrieved or searched are entered, in this Boolean operators are not used. In this type of internet search, the absence of a symbol is also significant, for example the space between the keywords; c) default language in a template that the user fills. Some engines offer a search template that allows the user to select the Boolean operator from a menu. Often the logical operator is expressed in substitute language instead of being presented as in the operator itself.

Ramírez García and other authors [11-15] also propose strategies for the search for information and the key calls for a better search. The first is to refer to narrow, that is, reduce as much as possible the search phrase until it is as accurate as possible to the search that is performed. The second key is to specify; perform the search with the exact phrase; This is surprisingly useful.

The third is to trim; process that is carried out gradually at the website address (URL); and finally it is possible to look for pages that resemble, that is; electronic address that have any direct relationship with the subject or material that you are trying to locate.

## **Conclusion**

Based on the results of the present study, it is concluded that the scientific question was answered; in such a way, that for a formal search procedure, the use of Boolean search engines - which are considered as part of the ICT tools - is proposed, and must be applied following the following stages:

- a) Formulate the keywords.
- b) Formulate the search profile-OR. AND, NEAR, Etc.
- c) Carry out the search.
- d) Discriminate the information.

At the end of these stages, it is necessary to evaluate the quality of the search (level of evidence), if it is satisfactory; Save the results. If the search was unsuccessful, restart the procedure and determine in which of the stages the error is; that way correct it and get the required information.

The present study can be more enriched if the following strategies are applied, with the intention of improving the procedure for obtaining scientific information, based on Information and Communication Technologies in postgraduate students of medical specialties.

1) Prior training to the postgraduate student of medical specialties, for the proper use of Information and Communication Technologies. 2) When applying the Boolean search and discriminating against the citations found, it is very helpful to identify and apply the Evidence-Based Medicine method, which complements the level of evidence that each selected article has and of this form will be a successful search.

When deciding to perform a formal search procedure, it should always be considered that the behavior is aimed at locating information in a systematic way.

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**Volume 6 Issue 3 March 2020**

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