Chapter 4

Search strategies and information sources on the web used by students of an integrated technical course

10.56238/tfisdwv1-004

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ABSTRACT
This article reports the experience of an intervention project designed to teach web information search strategies, to allow students to better satisfy their information needs. This intervention was divided into three phases: diagnosis of the search strategies used by the students; teaching Web information search strategies and indicating information sources for academic activities; evaluation of what the students learned by attending the course. At the end of the intervention, the students reported optimism regarding the advanced search tools on Google learned and envisioned more assertive and direct queries, causing them to spend less time with the disposal of useless results resulting from inaccurate and generalist queries. Regarding scientific journals, students eulogized the advantage of easy access to reliable scientific articles, which, in addition to offering quality content, eliminates the need to investigate the reliability of the content. Concerning Pergamum, the students highlighted the possibility of searching for titles without having to be present at the institution, in addition to the greater possibility of knowledge of the campus collection and other network campuses, in case of eventual future need. Finally, it is concluded that the more experience the students acquire with the search and use of information, the better their learning of school content may be and the better prepared they will be for the challenges life presents them.

Keywords: Information Search, Information Sources, Intervention, Web.

1 INTRODUCTION

Today, we live in a wealth of information provided by the advent of the World Wide Web (Internet). The amount of information available is enormous and follows a growing trend with relatively low costs to maintain the storage infrastructure. With access in a more friendly way to users of information without technical knowledge in computing through Web browsers (World Wide Web), the use of the Internet has become popular and has brought many changes to the way we seek information, consume, relate, etc. According to Santos et al (2020), the advent of the internet has brought great social, economic, technological, political, and cultural transformations, even impacting education.

Search engine websites were created to allow the user to search for other websites stored on the Internet through keywords. However, it still appears that some people still do not know how to use the various possibilities offered by these search engines. It is common to observe, in the school context, students do not know how to efficiently search for the information they need on the Web. They also sometimes don't know how to discern which are the best sources of information to base themselves on.

Some students may be content with the first item in the search results list, while others are frustrated at not being able to satisfy their need for information to perform a certain task. The difficulty of discerning which are the most suitable sources for the type of information they are looking for also ends up becoming a reason for doubts and uncertainties for students.

When there is a need to carry out scientific work, the situation can worsen even more, as students often do not know the databases that contain scientific articles published in journals. For this reason, some students limit themselves to the search for information in newspaper articles and sites such as Wikipedia to carry out their academic activities, precisely because these are more accessible and known. However, limiting themselves to these sources ends up being a bigger problem for them when they need to carry out activities that demand greater scientific rigor. Therefore, the relevance of the application of an intervention project that tries to solve this informational gap of the students is noticed, providing the knowledge of reliable bases of scientific articles, wider use of the possibilities of consultation in the search engines sites, and the use of the Pergamum system to search for books and other teaching materials available in the libraries of the Instituto Federal da Bahia, where the intervention was carried out.

This intervention also goes against the New High School Reform law (Brasil, 2017), in which, according to Melo et al (2020), curricula must consider the integral formation of the student, adopting a work that aims to build their life project and that they carry out an education that promotes the development of their physical, cognitive and socio-emotional aspects. Thus, informational competence is a fundamental part of the integral development of the student.

Thus, this article reports the experience of an intervention project carried out to teach information search strategies on the Web, to allow students to better satisfy their informational needs.

The article fits into the genre of experience report, about the methodological point of view, which is a detailed narration of lived experiences from the point of view of the person who reports (narrator). The results are described descriptively, interpreted, and discussed in the light of a theoretical framework. (GROLLMUS; TARRÉS, 2015).

The next sections of this work are organized as follows: theoretical foundation, methodology, results, final considerations, and references.

2 THEORETICAL FOUNDATION

The information-seeking behavior may have its origin in the recognition by the user of some need for information. According to Case (2007, p.5, our translation), "the need for information is the recognition that your knowledge is inadequate to satisfy a purpose you have". Wersig (1971 apud BELKIN, 1980, p.136) suggested that the recognition of a problematic situation motivates the individual to seek information. In this aspect, the individual recognizes that his model of the external world is insufficient in terms of some desired goals. Dervin (1983) states that the user starts the process of searching for information when he perceives a cognitive gap that needs to be filled with information. Thus, the individual is dedicated to the search for information to give meaning to a situation.

According to Belkin (1978), an individual is prompted to seek information after recognizing an anomaly in his or her state of knowledge (Anomalous State of Knowledge) on some topic or realizing his inability to resolve a problematic situation. An anomaly indicates a state of inadequacy due to a lack of

knowledge or uncertainty in some situation (BELKIN, 2005, p.44-45). The anomaly perceived by the individual gives rise to a need for information. One can convert the anomalous state of knowledge (ASK) into some communicable structure. For example, the information need can be expressed as a question to obtain the appropriate information to resolve the anomaly and satisfy the need.

Uncertainty is an early stage in any quest and is often accompanied by feelings of anxiety. Thus, uncertainty reduction is a key component of the search process. According to Kuhlthau (1993, p.345, our translation), "[...] the search for information can be seen as a construction process in which users progress from uncertainty to understanding". Case (2007, p.51) agrees that the active acquisition of information implies the recognition of uncertainties or anomalies.

Wilson (2000, p.49) defines the intentional search for information as a consequence of the need to achieve some objective. For him, information behavior is the totality of human behavior about sources and channels of information, including active and passive information seeking and information use.

Likewise, Case (2007, p.5) describes the search for information as a conscious effort to obtain information in response to a need or a cognitive gap. When engaging in search, users are interested in gathering enough information to feel satisfied with the process. However, this does not mean that the information obtained is the most complete, accurate, and detailed. According to him, informational behavior encompasses intentional behaviors such as information seeking and the active act of avoiding information (selective exposure, information rejection, poverty, and information overload), as well as other unintentional or passive behaviors.

Dervin (1983) considers information seeking to be a meaning-making process in which the individual is actively involved in seeking meaning from information to gain a new understanding of a topic or a solution to a problem. According to Kuhlthau (1988, p.233), the search for information is a process that progresses through phases or levels. At first, the individual has a vague notion of lack of information. After the recognition of an information need, there is a progression "[...] in identifying a general topic, in exploring information about a general topic, in formulating a specific focus, in gathering information relating to the specific focus, after the search for information" (KUHLTHAU, 1991, p.368).

The search for information sometimes proves to be not so thorough and accurate even in the field of information professionals, that is, those who have information as an element of work. According to the literature, the most important factor for professionals when choosing a font is accessibility (relative ease of access). Professionals prefer to use more accessible and familiar sources of information. Accessibility and familiarity are factors more valued by professionals when seeking information than perceived quality. This can be sacrificed to minimize the cost of obtaining information. In their search for information, this type of user considers that informal channels have equal or greater importance than formal ones. For example, professionals consider colleagues to be an accessible and inexpensive source. The exchange of information with colleagues also promotes socialization and the generation of professional contacts (LECKIE; PETTIGREW; SYLVAIN, 1996). Even having a focus on information-seeking behavior by professionals,

as in this specific article the author focused on engineers, health professionals, and lawyers, despite postulating that the model applies to all professionals, we consider it pertinent to extend these authors' conclusions to the students' search behavior, the population to be worked on in this intervention project.

There is also the possibility that, during the information-seeking process, assessments of information sources or the practitioner's awareness of available information may change. Thus, further search attempts may be necessary. The search can result in success or failure in terms of finding relevant information to satisfy that need. If successful, the individual can use the information found and also share it with others. However, if the information found partially satisfies or fails to satisfy the need, the individual may have to repeat the search process (WILSON, 1999, p.251).

Taylor (1968, p.5) indicates that the need for information can be expressed at four levels: visceral, conscious, formal, and according to the requirements of an information system. The visceral need is a real but unexpressed need or even an unconscious need for information that can be experienced as vague dissatisfaction. The conscious need is an ambiguous and ill-defined description within the brain of need. The formalized need is characterized as the formal statement of need in which the information sought can be described in concrete terms. Finally, the compromised need is considered as the question translated into well-defined terms of a given information system. Thus, Taylor reveals that the expression of the information need can progress through phases or levels starting with a vague notion of lack of information.

At the last level of expression of the information need, the compromised need translated into terms accepted by a given information system, difficulties arise for the user to adapt to the requirements of the system to carry out a successful information search. Therefore, the relevance of studying information search strategies in Web-based systems, where a lot of useful information can be found, but there is also a lot of useless information, demonstrating the need to know how to filter the information returned by these systems through refined and selection of the most adequate and reliable sources to fill the cognitive gap and consequent generation of knowledge.

Information search is related to the way people search for information that meets their needs. It involves the active or passive search for information, planning, strategies and motivation to achieve objectives, monitoring strategies, knowledge, the definition of potential channels or sources of information, competencies to use information technologies, and evaluation of this process.

Added to all this, we are in the "Information Age or digital age", according to Barros et al (2020), as technology extends to all spaces of human social coexistence, it is not just present, but it modifies the forms of work, of culture among peoples, of education and, above all, of communication.

3 METHODOLOGY AND OUTCOMES

To carry out this intervention project, which aims to provide the discs with strategies for searching for information on the Web, a mini-course with a workload of 3 hours was offered. This mini-course, entitled "SEARCH STRATEGIES AND INFORMATION SOURCES ON THE WEB", was held on

October 25, 2019, during the National Science and Technology Week, within the schedule of the III Integrating Seminar of the IFBA Campus Camaçari.

The Integrating Seminar is an umbrella event, comprising the Research and Extension Seminar; the Pibic Junior Seminar; the Mathematics Meeting; the Teacher Training Seminar, and the National Science and Technology Week. This event aims to unify the traditional teaching, research, and extension events promoted by the campus. Through the research network, students, and community, the Integrating Seminar has the mission of enhancing dialogue, the dissemination of productions, and collaboration among the academic community of the IFBA Campus Camaçari.

The registration for the mentioned mini-course was carried out 15 minutes before, that is, the course started at 9 am on October 25, 2019, and registration was at 8:45 am on this start day. There were 18 students enrolled in the mini-course. Of all students of the high-level technical course "Technical in Informatics" of the integrated modality, in which 67% were from the 1st year and 33% from the 2nd year. This intervention was strong in three phases: diagnosis of the search strategies used by the class; teaching strategies for searching information on the Web and indicating sources of information for carrying out academic activities; evaluation of what was assimilated to the class after learning about the best search strategies.

The diagnosis of information search strategies practiced by students on the Web was carried out through the application of a study designed to know how the center of the search for information on the Web in situations where they need information such as studying; carrying out work and searching the web in general

According to the answers collected on the site, no student knows Scielo, Portal de Periódicos Capes, and Google Acad. initiation through apprenticeship would take place in scholarship editions. In addition, the student who cannot complete an intermediate stage of completion in some courses to reach the diploma of technical level. In this way, the scientific bases corroborate the maturing of the student in the search for information, knowledge, and knowledge of serious studies, by investigation of identification by researchers.

All students had already used Google search in a basic way without making use of advanced search. No student knew about Google Alerts, which allows automated searches to be carried out in certain periods. All students said they had heard about the Pergamum library system, however, only one student said that he uses it to search for books.

These results are in agreement with Pereira et al. (2014, p.26) when they state that:

> "The search in search engines does not necessarily translate into quality, as the results show that the use of this tool is simple and that the vast majority do a superficial search, only by keywords or subject, not using any type of research. deeper with filters – many are even unaware that these mechanisms exist. Students do not seem prepared to find what they are looking for: the tool is known, but they do not have the necessary skill to correctly filter what they are looking for. There is also evidence of immediate research behavior, easily and comfortably, which goes in the opposite direction to that recommended by the autonomous search for learning." (Pereira et al, 2014)

Thus, the simple search in automated systems on the Web does not provide critical study, as it is based on preliminary results without in-depth research using only keywords or phrases without any type of specific filter. In addition, many are satisfied with the first results obtained and do not research on a scientific basis, are limited to information present on sites that, many times, do not have a rigid verification of the veracity and accuracy of the information contained therein.

The study by Abe and Cunha (2011, p.10) concluded that students prefer to seek electronic information, to the detriment of traditional printed sources. When they can't find what they're looking for on the Internet, they look in books.

The teaching of search strategies on the Web consisted of transmitting to students the best practices of searching for information on the Web through the most used search tools such as Google, Google Scholar, Scielo, Periódico Capes, and the search tool of Pergamum didactic material, adopted by the institute's libraries. For this, we intervened in a workshop with a teaching methodology where practical activities were carried out. The instruments used include a computer lab with machines connected to the Internet; Web browsing software, a whiteboard, and a multimedia projector. The search strategies taught were:

- Active search (term, advanced search, operators);
- Passive search (notifications).

The sources of information addressed were:

- Google;
- Google Alerts;
- Academic Google;
- Pergamum;
- Scielo;
- Periódicos Capes.

The subject was introduced with a brief history of the Internet (a worldwide network of computers), which allowed the storage and sharing of a large amount of information through computers connected to a network. However, even so, in the early days of this technology, it was difficult to access information on these computers due to the requirement of technical knowledge and the existence of very specialized and unfriendly software for the lay public in computing.

This reality began to change when web browsers based on the HTML language were developed. HTML (short for the English expression HyperText Markup Language, which means HyperText Markup

Language) is a markup language used in the construction of web pages. The idea of HTML pages is based on documents containing objects other than just text (like audio, video, etc.) connected by hyperlinks. From the hyperlinks, it is possible to navigate from one document to another in a very intuitive way. With access in a more friendly way to users of information without technical knowledge in computing through Web browsers (World Wide Web), the use of the Internet has become popular and has brought many changes to the way we seek information, consume, relate, etc. The most used web browsers today are Google Chrome, Apple Safari, Mozilla Firefox, and Microsoft Internet Explorer.

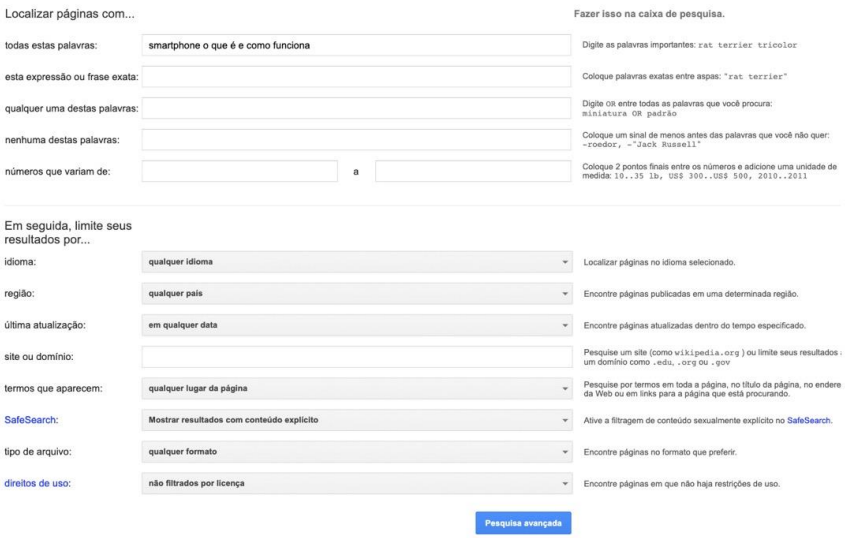
However, it was explained that finding relevant information on the Web started to become almost impossible. Because of this, websites with search engines have emerged, where the user can search for websites and other content stored on the Web through search terms. Search engine websites were created to allow the user to search for other websites stored on the Internet through keywords. The five most used search engines are Google, Yahoo, Bing, Ask, and Aol.

After introducing the subject, we moved on to the practical part of the intervention in which students were asked to perform web searches using the Google search engine. When performing a search using the keyword “oil”, we noticed that the first links in the search result dealt with the oil that appeared on the beaches of the Northeast. The search engine contextualized the term with the news of environmental crime widely disseminated at the time.

When we searched for the term "Smartphone", we found that the first links dealt with advertisements for the sale of cell phones and smartphones. To have pages in the search results that explain what a smartphone is and how it works, we had to add the terms "what it is" and "how it works". In this case, the Wikipedia page link came up in the first search results. Wikipedia is a collaborative encyclopedia project made available on the Web. Its purpose is to provide free, objective, and verifiable content that everyone can edit and improve. The snag of Wikipedia is that anyone can publish and change content, creating a problem when malicious or uninformed people post false or incorrect information. Thus, the academic community recommends that Wikipedia be used as a source to get an initial idea about a topic/subject, and the student should look for other sources to verify and deepen what he has read.

We also show that you can perform an advanced search that allows you to search for terms, exact phrases, range of values, language, and country, among other possibilities (Figure 1). It is also possible to use symbols or words in the search to make the results more accurate, for example, you can use "@" before a word to search in social media, "$" before a number for a price search, "#" to search for hashtags, "-" before a word to exclude it from the search, put a phrase in quotes to search for exactly that phrase on websites, ".." to search for a range of numbers, "OR" to combine searches, "site:" to search on a specific site, "related:" before a web address to search for related sites.

Figure 1 - Advanced Google Search

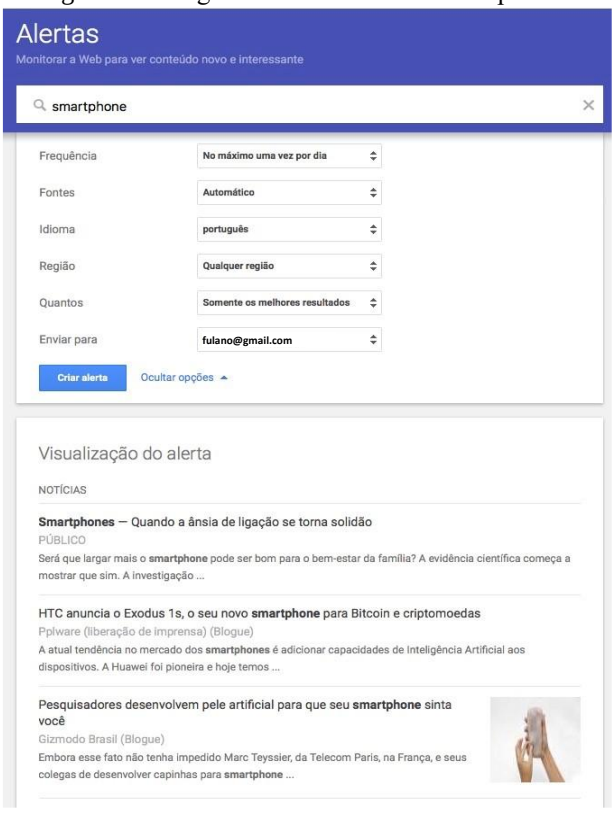


Source: https://www.google.com/advanced_search (2021).

Google Alerts was another source of information addressed in the intervention. Through this tool, the user can define search terms where Google itself monitors the web to deliver new content. Thus, it is an interesting product that allows the search to be carried out passively, that is, the user defines the terms only once and the search can be configured to run different periods, such as once a day, for a week, month, etc.

Figure 2 shows the configuration of a Google alert for the term "Smartphone" where the search will be performed once a day.

Figure 2 - Google alert for the term “Smartphone”



Source: adapted de https://www.google.com.br/alerts (2019).

Google Scholar is a tool for searching articles published in scientific journals using keywords or phrases. It is a very important tool for students to research scientific articles to support the theoretical foundation of their work. The basic difference between regular Google search and Google Scholar search is that in the former the search has a wide range of sources like any website that is available on the Internet. Google Scholar, on the other hand, limits the search to databases of scientific articles. The reliability of these bases comes from the fact that an article is only approved for publication in scientific journals indexed in Qualis Capes if it meets the requirements of the journal and undergoes evaluation by a committee of researchers.

In addition to Google Scholar, the use of the CAPES Periodicals Portal was demonstrated, which provides electronic access to students from public state and federal educational institutions to download and read a series of articles published in respected national and international scientific journals through a partnership between the Federal Government and the publishers. Scielo was also approached because it is a portal that offers free access to scientific articles from reputable Brazilian journals.

Finally, Pergamum was addressed in this intervention because it is a search system adopted by the libraries of the Instituto Federal da Bahia (IFBA). This system allows searching for resources such as books in the libraries of the entire institution. The user can find out if there are books available for loan and can reserve and renew books remotely. Books continue to be very important sources of information and should be used by students to support the construction of knowledge.

At the end of the intervention, the students were invited to evaluate to verify whether the information search strategies taught became part of the way students search for information on the Web. This evaluation did not have the character of classification among the students and was not assigned a grade, it only served the authors of the intervention to know if the students' search behavior underwent any change after they were exposed to best search practices.

The students reported a good surprise with the possibilities of searching on Google presented and considered it important to use advanced engines in their searches. They also showed that the results from searches using a combination of operators are more assertive, taking the student straight to the point, and saving time by reducing the amount of information to be discarded. This excess information is the result of more imprecise and generalist searches. In this question of search expertise, it is clear that students envisioned a more effective search coming from greater control over the tool. It is precisely on this lack of experience and deeper knowledge of the search that Pereira et al. (2014) state that there is a problem regarding the quality of search results.

It is important to emphasize that as inconvenient as the lack of information the excess of pages with useless information to the final objective of the research, needs to be discarded from the scope. All activities that needlessly steal time should, at best, be eliminated.

We must emphasize that the fact that the students in the sample were students of the technical course in informatics was a positive factor for the adaptation in the advanced consultation. Students are already

familiar with operators, string search and comparison, and concatenation of symbols and special characters (eg @, #) because these aspects are part of the content of the logical programming discipline. This course is introductory and is part of the first period/semester of any course in the Information Technology area, both in technical courses and in higher education courses.

Therefore, we must take this fact into account when we mention the quick adaptation and the good reception of the students when we present and propose practical exercises using advanced queries.

Regarding scientific journals and academic Google, the students committed to using them in the future as they realized the easy access to reliable information since the observation of the reliability of the information must be part of any work to be presented during academic life. of the student. The appreciation of this important aspect of easy access to reliable scientific information corroborates the premise of LECKIE, PETTIGREW, and SYLVAIN (1996) when saying that one of the most valued characteristics during a search for a source is accessibility (relative ease of access).

Regarding the search features in Google Scholar and Scientific Journals, these did not offer more difficulties or new information as they were displayed after the demonstration and advanced query exercises on Google. Regarding the accessibility of academic Google to scientific articles, the students also highly valued this feature, as the ease of access ends up making the work more fluid, as it eliminates the difficulties present in this stage.

About Pergamum, students pointed out that being able to consult the titles of books and availability anywhere without having to be physically present in the school library is an advantage. They also praised the possibility of greater knowledge of the campus collection, as well as titles available in other units, in case of an eventual need shortly.

4 CONCLUDING REMARKS

With access in a more user-friendly way to inform users without technical knowledge in computing through Web browsers (World Wide Web), the use of the Internet has become popular and has brought many changes to the way we seek information, consume, relate, etc.

Search engine websites were created to allow the user to search for other websites stored on the Internet through keywords. However, it still appears that some people still do not know how to use the various possibilities offered by these search engines, and also, sometimes, they do not know how to discern which are the best sources of information to base themselves on.

People usually prefer to use more accessible and familiar sources of information and consider informal channels to be of equal or greater importance than formal ones. Thus, accessibility and familiarity are more valued factors in the search for information than perceived quality, and the exchange of information with other people promotes socialization and relationship building.

The study of information search strategies in Web-based systems is relevant, as one can find a lot of useful information on the Internet, but there is also a lot of useless information, demonstrating the need

to know how to filter the information returned by these systems through refined searches. and selection of the most adequate and reliable sources to fill the cognitive gap and consequent generation of knowledge.

Information seeking is related to the way people look for information that meets their needs. It involves the active or passive search for information, planning, strategies and motivation to achieve objectives, monitoring strategies, knowledge, the definition of potential channels or sources of information, competencies to use information technologies, and evaluation of this process.

Therefore, the relevance of applying an intervention project that tries to remedy this informational gap of the students is noticed, providing the knowledge of reliable bases of scientific articles, broader use of the search possibilities of the search engines sites, and the use of the Pergamum system to search for books and other teaching materials available in IFBA libraries.

Thus, this article reports the experience of an intervention project carried out to teach information search strategies on the Web, to allow students to better satisfy their informational needs. A mini-course, entitled "SEARCH STRATEGIES AND INFORMATION SOURCES ON THE WEB", was held on October 25, 2019, during the National Science and Technology Week, within the schedule of the III Integrating Seminar of the IFBA Campus Camaçari. The workload was 3 hours.

This intervention was divided into three phases: diagnosis of the search strategies used by the class; teaching information search strategies for the Web and indicating sources of information for carrying out academic activities; evaluation of what was assimilated by the class after learning about the best search strategies. The diagnosis of information search strategies practiced by students on the Web was carried out through the application of a questionnaire designed to know how the student searches for information on the Web in situations in which informational needs arise, such as study; academic work, and web research in general.

All students stated that they did not know Scielo, Portal de Periódicos Capes, and Google Scholar. All students had already used Google search in a basic way without making use of advanced search. No student knew about Google Alerts. All students claimed to have heard about the Pergamum library system, but only one student said they used it.

The teaching of web search strategies consisted of transmitting to students the best practices of searching for information on the Web through the most used search tools such as Google, Google Scholar, Scielo, Periodical Capes, and the material search tool. Pergamum textbook adopted by the institute's libraries. For this, the mini-course taught had a teaching methodology where practical activities were carried out.

At the end of the intervention, the students were invited to evaluate to verify whether the information search strategies taught became part of the way students search for information on the Web. This evaluation did not have the character of classification among students and was not assigned a grade, it only served to inform the authors of the intervention to know if the students' search behavior changed after they were exposed to better search practices.

Students reported optimism about the advanced search tools on Google learned and saw more assertive and direct queries, causing them to waste less time discarding useless results resulting from imprecise and generalist queries. We realized that the fact that the students studied IT was undoubtedly a positive factor for the quick adaptation in the advanced query interfaces. Regarding scientific journals, students praised the advantage of easy access to reliable scientific articles, which, in addition to offering quality content, eliminates the need to investigate the reliability of the content. Concerning Pergamum, students praised the possibility of researching titles without having to be present at the institution, in addition to the greater possibility of knowing the collection of the campus and other campuses in the network, in case of any future need. Finally, it is concluded that the more experience students acquire with the search and use of information, the better their learning of school contents will be and the more prepared they will be for the challenges that life presents them with.

As a future work, we intend to carry out a study where we will investigate the teachers' perception of the quality of the work developed by the students after being trained in this workshop on strategies for searching information on the Web. We intend to work with first-year classes, and with a control group, which will not be trained right at the beginning of the school year. However, for ethical reasons, in order not to offer the training only to the group that will participate in the research, we will offer the same workshop at the end of the school year for the group that has not yet taken the training.

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