

INFORMATION MANAGEMENT PROCESSES FOR EXTRACTION OF STUDENT DROPOUT INDICATORS IN COURSES IN DISTANCE MODE

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Abstract: This research addresses the use of information management processes in order to extract student dropout indicators in distance mode courses. Distance education in Brazil aims to facilitate access to information. The MEC (Ministry of Education) announced, in the second semester of 2013, that the main obstacles faced by institutions offering courses in this mode were students dropping out and the resistance of both educators and students to this mode. The research used a mixed methodology, qualitative and quantitative, to obtain student dropout indicators. The factors found and validated in this research were: the lack of interest from students, insufficient training in the use of the virtual learning environment for students, structural problems in the schools that were chosen to offer the course, students without e-mail, incoherent answers to activities to the course, lack of knowledge on the part of the student when using the computer tool. The scenario considered was a course offered in distance mode called *Aluno Integrado* (Integrated Student)¹.

Key-Words: Information Retrieval. E-learning. Information Management. Student Evasion..

I. INTRODUCTION

Distance Education in Brazil has emerged to complement the educational needs in Brazil in order to facilitate access to education. This type of education gained greater emphasis worldwide with the development of the Information and Communication Technologies (ICTs).

Distance education is a modern modality mediated, by technology in which students and teachers are separated spatially and / or temporally., In other words, they are not physically present in a classroom environment of teaching and learning according to the decree No. 5622 of December 19, 2005 Decree No. 5622 [8] of the Brazilian Constitution. Hereafter, distance education has proven to be a teaching mode that allows access to education regardless the student's location moreover it facilitates access to the same training as it allows the student to manage his/her own time and to choose where to study.

E-learning appears to meet the increased need for professional training that is required by the current labor market., Such an evaluation is corroborated by Lenzi [9] who states that:"Because of the need for constant training and the arrival of globalization, the education market needed to expand,

developing strategies and adjusting to respond to both technological change and social demand" (LENZI, 2014, p.29).

The Brazilian Association of Distance Education - ABED, a scientific nonprofit society, which aims to foster studies and projects in distance education, published in its latest analytical report of distance learning in Brazil the 2013 Census EAD.br / 2014 highlighted students dropping out as the biggest obstacle for distance learning in Brazil [5].

Student dropout is a complex phenomenon, defined as when a student voluntarily leaves a course without completing it successfully. It is the result of a number of factors that influence the student's decision to stay or not in a course. Evasion is one of the problems inherent in the distance education system that concerns educational institutions because it wastes financial, social and human investments thus making it the biggest concern of the course's managers.

When considering evasion as a major problem to overcome in Distance Education, it is necessary to seek solutions to minimize it. The professional connected directly to the student through the learning platform is the teacher / tutor. One of their duties is to have the responsibility of monitoring the virtual learning environment. This responsibility includes, for example, the correction of activities answered by students, monitoring the frequency that the learning platform is accessed. The teacher or tutor in a virtual learning environment is the mediator between the information and knowledge, and the student. There are differences between a regular education teacher/tutor in distance education and the traditional system. Sá[12] established these relationships and differences. This research uses the term tutor to refer to the teacher in the virtual classroom.

To assist the tutor in his work, the Virtual Learning Environment provides some information about the student's performance, such as the statistics of access to the education module, system access, activities, chat rooms, polls, forums, and daily classes. Virtual Learning Environments (VLEs) are used in distance education in order to mediate Student-Tutor, Tutor-Student, and Learning-Material-Student communication. Furthermore, they are used to allow the whole process of

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dissemination of knowledge and information that courses in this modality require. According to Bucci [3], learning platforms include: Moodle, TelEduc, AulaNet and e-ProInfo. However, the information provided by the AVAs does not contain all the information about the educational process from a distance course, as the teacher-student relationship is not measured by the virtual learning environment.

Considering the topics that have been mentioned, the present work aims to use the information management processes to identify and validate student dropout indicators that emerge naturally from the teacher-student interaction in a virtual learning environment. The scenario analyzed was in a distance mode course offered for elementary school students in the state of Minas Gerais in 2010 and for high school students in 2013.

II. LITERATURE REVIEW: MANAGEMENT INFORMATION AND INFORMATION ARCHITECTURE

One of the aspects of Information Science which coincides with this research approach is that it categorizes information as a thing and as information and knowledge. Based on these concepts, Buckland [4], identifies managing information, from creation to storage, as something that promotes a fruitful environment for the information user. Furthermore, Buckland [4] suggests that the information can be used as information to process; Information as knowledge; Information as thing.

According to Nonaka and Takeuchi [11], to identify tacit knowledge is the essential element in the generation of knowledge. By tacit knowledge is meant individual knowledge, such as technical and informal skills of each person, obtained by transforming the personal knowledge of an individual into explicit knowledge. The term knowledge refers to formal knowledge that can be stored on any media, thus externalizing tacit knowledge of individuals seeking to consolidate the information.

Students' failure to log in or appear in virtual classes were placed on reports made by tutors during 2010 and 2013, Thus, the tutors were turning tacit knowledge into explicit knowledge, when creating reports. Nonetheless, according to Nonaka and Takeuchi [11], the spiral of knowledge is socialization, externalization, combination and internalization, as an outsourcing of knowledge that had already happened when the tutors created reports. This research is the combination process, which is the transformation of explicit knowledge into explicit knowledge, by using the explicit knowledge that appears in reports to systematize the information, with the creation of indicators of student dropout on a course in distance mode.

Information management involves four steps: 1 - Determine requirements, 2 - Obtain (Exploration, Rating, Format and structuring), 3 - Distribute, 4 - Use Davenport and Prusak [7]. The steps of information management in this research are to seek information concerning the student dropout

presented in reports written by Integrated Student project tutors, to identify, classify and validate evasion indicators.

The management process, be it in an organization or a course, implies decision making. This process is usually characterized by the presence of vagueness, ambiguity, conflict between objectives and technical uncertainty, Choo [6]. Decision-making should be shaped by rules and procedures based on a comprehensive understanding of the situation. To have a global situation one needs to see and to understand how all the interactions act in a teaching model in distance education. Therefore, it becomes an information necessity, and information architecture is used to meet this demand.

The information architecture proposes to organize the information to meet the information requirements of its users. Wurman [15] corroborates this, defining information architecture as used to organize inherent data standards and to create an information structure or map in order to allow others to find their own paths to knowledge, thus making the complex clear.

The information architecture is aimed at organizing information and supporting the flow of treatment and recovery of structured, semi-structured and unstructured information objects, in organizations (Victorino; Brascher) [14]. The basis of the research projects is the structuring of information and knowledge retrieval.

III. FLOW OF INFORMATION IN E-LEARNING

Information Science seeks to understand the whole situation and user behavior in their search for information before, during, and after their interaction with the system. Therefore, this science presents a more holistic view of the user, their needs and how this relates to the world.

The information in a distance education course is mediated by a virtual learning environment. All communication is performed via an e-learning platform. In a communication process a receptor and a channel are all required in a virtual learning environment. The sender or receiver can be the coach or the student, and the message channel is the learning platform.

The information flow in a Virtual Learning Environment (VLE) runs between the student's or tutor's search for information and the VLE itself with its database. The student searches for information in the available course material in the teaching module and the tutor returns this information to the student; the student seeks information from the teacher / tutor and receives feedback; the tutor provides information and searches for the information generated by the student; the student can also search for information on the available course materials on the teaching module. All information generated is stored in the virtual database learning system. In Fig. 1 shows how the information flows in the VLE.

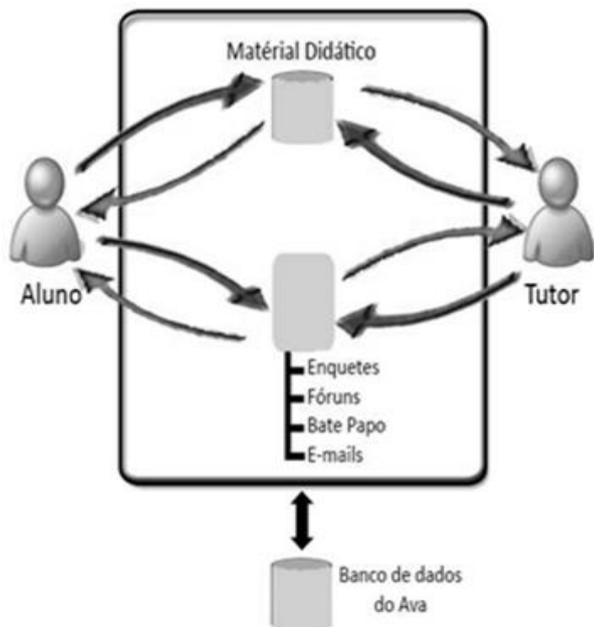


Figure 1 – E-learning Information flow.
Source: Created by the authors.

The communication between the student and tutor within the virtual learning environment flows equally from the tutor to the student as well as from the student to the tutor. Thus, it can be said that the tutor-student communication is bidirectional. Aretio [1] agrees by stating that e-learning "is a technological system of two-way communication." In Figure 2, which follows below, shows a model of tutor / student communication.

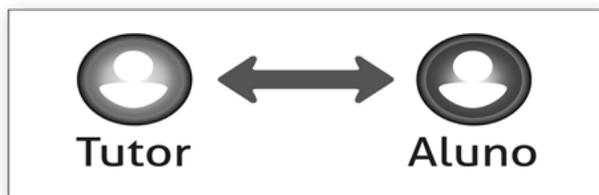


Figure 2 – Tutor/Student Communication.
Source: Created by the authors.

IV. METHODOLOGICAL PROCEDURES

This is a qualitative study intended "to generate knowledge for practical application and addressed to specific troubleshooting" (Souza [13]), and to combine the knowledge of the tutors in e-learning that has already been explained, to the reports for the creation of the student dropout indicators.

The present study is what Marconi calls exploratory. For Lakatos [10], an exploratory study often generates both qualitative and quantitative descriptions of the subject matter.

The search application scenario was conducted on a study case of the Integrated Student Project (Projeto Aluno Integrado). The choice of the project was due to the fact that the course was conducted in the years of 2010 and 2013 in the state of Minas Gerais. The scope covered both elementary and high school.

The Integrated Student Project is focused on education and technology for a better world, seeking to explore different perspectives within that theme in all basic education stages. The project addresses the need to create real and virtual spaces for training elementary education students, from Brazilian public education, qualifying them for the use of TICs.

The main references of this project are: the "Monitoring Report on Education for All in Brazil", prepared by UNESCO; the "Map of Digital Inequality in Brazil" and "pencil, rubber and keyboard: Information Technology in Education", both performed by RITLA and the Ministry of Education.

From these sources, the needs and goals of formal education in the country are defined, in order to establish relationships between technology and education so their contributions can improve the quality of the educational process and ensure its excellence.

The Integrated Student Project complements students' basic training and relevant qualifications, in the area of information technology, by encouraging technical training in managing the computer laboratory in order to ensure their effective use by all the actors contained in various educational settings (schools, foundations, NGOs, Education Departments, Universities, Telecenters and Community Associations).

It is a program offered by UFOP (the Federal University of Ouro Preto) in various training programs using distance methodology. Among these is the Continuing Education Media Program, first offered at UFOP in 2006.

In 2010 UFOP offered five thousand vacancies through the Ministry of Education (MEC) in the state of Minas Gerais. Additionally, it created the course with the support of UNDIME (Union county of education leaders), and in 2013 offered 2,060 vacancies in partnership with the education state board.

The overall goal is to empower teachers and students from the eighth grade of public elementary school in the use of Information and Communication Technologies. Moreover, it aims to support teaching and learning activities in public schools and the use of the aforementioned technologies.

The target audience was students enrolled in public networks of high school and in the eighth grade of elementary school in 2013 and 2010 respectively.

Table 1: Quantitative Integrated Student Project 2010

Jobs provided in Minas Gerais	5,000
Spaces allocated	3,971
Dropouts	1017 = 26.97%
Graduates	2917 = 73.45%
Passing Students	751 = 25.74% of graduates
Failing students	2,166 = 74.25% of graduates

Table 2: Quantitative Integrated Student Project 2013

Jobs provided in Minas Gerais	2,060
Spaces allocated	1968
Dropouts	1016 = 51.62%
Graduates	952 = 48.38%
Passing Students	442 = 46.43% of graduates
Failing students	510 = 53.57% of graduates

The data was collected by the Integrated Student project managers of 2010 and 2013. They chose 25 final reports from distance tutors in the integrated student project of 2010 and 10 from 2013. Thus, a total of 35 reports were to be analyzed from a sample population of 30 reports in 2010 and 20 reports of 2013. The sample was chosen after reading and analyzing all the reports and those with relevant information to the research were then selected. Vague reports or those without any information about student dropout were discarded because they were not useful.

The reading of the reports reveals a high frequency of selected messages which appear to define the student dropout indicators.

The units of analysis were the descriptive phrases of problems characterized by tutors during the course. The choice was made according to the theme of this research and focused on the problems that cause the student to dropout from courses offered in distance mode.

A questionnaire was applied in order to validate the data found in the research using a specialized team. This team was made up of people who work or have worked as tutors on a distance education course. The questionnaire was sent to 35 tutors and 22 responses were obtained. All participants answered all the questions that had been asked in the survey. This questionnaire consisted of three questions that addressed the indicators found in the research conducted.

Firstly, indicators were presented and tutors were asked to choose which of these they considered responsible for student dropout. Secondly, the responding tutor was then asked to put the indicators found in order of relevance assigning values between 1-6, with the value 1 being the most important and 6 the least. Thirdly, each tutor was invited to contribute their knowledge and experience on the specific subject of student dropout.

Table 3: Below shows the questionnaire.

Select the indicators that you, as a distance course tutor, consider student dropout indicators: <input type="checkbox"/> Insufficient training in the use of the virtual learning environment for students of the course; <input type="checkbox"/> Structural problems in schools chosen to offer the course; <input type="checkbox"/> Students without e-mail; <input type="checkbox"/> Incoherent responses to course activities; <input type="checkbox"/> Lack of knowledge on the part of the student when using the computer tool. <input type="checkbox"/> Lack of interest from the students;
Put in order 1-6, taking into account the priority (1 being the most important and 6 for the least important), according to your knowledge, the indicators: Lack of interest by the students; Students without e-mail; Limited capacity of the course students when using the virtual learning environment; Structural problems in schools chosen to offer the course; Inconsistent responses to course content activities; Lack of knowledge on the part of the student computer tool.
Based on your experience as a tutor, would you like to add one or more than one indicator of student dropout?

V. RESULTS

Presentation and analysis of results of qualitative research

The results of qualitative analysis using the reports indicated the following student dropout indicators:

- Lack of interest from the students - demonstrated by the absence or short stay in the educational platform, which can be verified through the learning environment and tool-ProInfo.
- Lack of email use by students - Despite being a requirement for them to establish communication -Tutor Student and Student –learning platform. Many students had created an email simply in order to study the course and did not frequently access the mail.
- Student limited capacity in using the VLE (Virtual Learning Environment). From the beginning of the course, despite attempts to access it, there was evidence of forgotten passwords or lack of knowledge regarding how to respond to the activities offered on VLE.
- Structural problems in the schools chosen to implement the course - even though schools were required to have internet connection and computer laboratories, many were selected without fulfilling this requirement.
- Lack of study of the course learning modules was demonstrated by vagueness in the responses to activities presented in the VLEs
- Participants did not demonstrate any knowledge of the computer tool – The majority of the chosen students were unaware of how to turn the computer on, or use its software or hardware communications through the keyboard or mouse.

Presentation and analysis of the results of the quantitative research.

Following are the questions and answers obtained from the questionnaire and then an analysis of the results. As mentioned above, 22 responses were obtained.

A team of experts recommended the indicators they considered responsible for student dropout. Table 4 below shows the rate and proportion of indicators accepted by the team.

Table 4: Rate and proportion of indicators accepted by the team.

Indicator	Validation as a percentage, considering two decimal places.
Lack of interest from the students	77%
Students limited capacity to use the virtual learning environment	50%
Structural problems in the schools chosen to offer the course	50%
Students without email	40.90%
Incoherent responses to course activities;	22.73%
Students' lack of knowledge when using the computer tool.	50%

Table 5: Summary of responses to the second question.

Indicator	1	2	3	4	5	6
Lack of interest from students	11	4	1	3	2	1
Limited capacity when using the virtual learning environment	5	1	5	5	4	2
Structural problems in the schools chosen to offer the course	3	10	3	3	3	0
Students without email	1	3	8	1	6	3
Incoherent responses to course activities;	0	1	1	8	2	10
Students' lack of knowledge when using the computer tool.	2	3	4	2	5	6

Table 6: Degree of relevance.

Degree of relevance	Standard deviation
1	3.636237
2	3.036811
3	2.426703
4	2.285218
5	1.490712
6	3.399346

The indicator considered the most significant was the lack of interest from students; second, the structural problems in the schools that had been chosen to offer the course; third, Incoherent responses to course activities; fourth, students without e-mail; fifth, the lack of knowledge when using the computer tool and sixth, the indicator considered the least relevant was the limited ability of students to use the virtual learning environment.

Question 3 of the questionnaire was an open question, to encourage the exchange of knowledge among specialists. The question was: Based on your experience as a tutor, would you like to add one or more than one indicator of student dropout?

Tutors' opinions presented in order to add knowledge to the research work, remembering that our focus is the tutor teacher ratio within the VLE. From the responses obtained with question 3, we can emphasize the following contributions:

- Increase the training time of students in the learning platform;
- Present motivational elements for the student both with in-person meetings and in interaction through the learning platform;
- Face-to-face discourse on the course content and why it will be important for the student to complete it;
- Try, in the community (with the help of NTE, telecenters etc), to create a partnership so that course participants can effectively take the course if they do not have personal computers;
- Match with the direction of the schools, greater support against the conduct of the course, so that these institutions can provide computer laboratories for student participation;

- Work with motivational texts in the course material, so that the course participants feel more self-confident and independent to satisfactorily follow an e-learning course;
- Mobilize other teachers to also increase the use of ICTs as an important tool of learning in their classes, so that students can go forward in the world of technology.

VI. CONCLUSION

The data obtained from this research shows the student dropout indicators seen from the perception of the tutor. They appear in the tutor / student interaction and tutor / Virtual learning environment, which have been explained in the reports used in this study and validated by a team of tutors who work or have worked with distance learning. Therefore, this research acts to disseminate knowledge already consolidated by tutors in distance education.

The presented indicators serve to guide professionals working with distance education. Based on these, both managers and tutors can create action plans that seek to minimize the problem of student dropout in this type of education in Brazil. It is a fact that the tutor figure influences the results of distance learning courses, as tutors interact directly with the student throughout the course. A non-qualified tutor can lead to many students dropping out, just as a tutor prepared to deal with distance education can play a role of excellence and ensure the success of the course.

With indicators found in this study, we present some recommendations of actions that can be taken according to each indicator found.

The lack of interest from students: the teacher can act to motivate students to complete the course, do activities and participate in forums, among others. According to Bottentut and Coutinho[2], one of the great challenges for the tutor is to maintain student interest and ensure their presence in Virtual Learning Environments. Chat rooms can be created to increase dialogue with students and the interaction among students in the class, increasing closeness and intimacy necessary for improved learning.

Insufficient training for students in the use of the virtual learning environment: when the tutor identifies this problem, they can attach videos and tutorials that help participants using the VLE with regards to the content of the course, and additionally report the needs for new training of students on VLE to the project manager, so that the latter can undertake the course. The perception of this problem requires urgent and direct action from the tutor as without the knowledge of the Virtual Learning Environment the student cannot take the course.

Structural problems in schools chosen to offer the course: structural problems refer to computer laboratory equipment that does not work or are closed for student access. The tutor can communicate this problem to the project manager, and the manager, in turn, must act by contacting the school in order to address the problem. . Mediation by the tutor will provide those students who have no computer at home an environment to study; which will then increase the number of students who can access distance learning. It is worth highlighting that Nielsen (2014), on an IBOPE estimate, points out that there are 120.3 million people with Internet access in Brazil. However,

according to the IBGE (2015), the Brazilian population in 2015, is 204 549 271 people, therefore the number of people is still very low given the population of the country. Considering e-learning as a way to bring education to all social classes and an increased number of people, it is necessary to take measures to enable their access to computers and the internet. To this end, students who do not have computers must have the school's assistance to take the courses offered in the distance modality.

Students without e-mail: the distance learning tutor can contact the classroom tutor, who should contact the student and create an email so the communication with the students is conducted. The intervention of the tutor becomes essential in this situation because without access to e-mail the student will not receive extra instruction, motivational texts, or information on the schedule of the course. Despite being within the VLE, the notification and e-mail service enhance communication with the tutor and informs the student of the activities that must be performed.

Incoherent responses to course activities: the tutor can contact the participants in order to guide them in how to respond to the activities correctly, study the material provided by the course then it is not rejected by note. Often, the student is not used to learning by distance and finds it difficult to express their ideas in writing within the Virtual Learning Environment. Many students, aware that their responses are exposed to the teacher and classmates, also exhibit shyness. These difficulties could therefore be alleviated in private conversation between the student and the tutor, who, in turn, should encourage the student to give their opinion and to respond to the ongoing activities properly.

The lack of knowledge by the students of the computer tool: the use of technology in teaching is considered difficult for many students and this is also a reason for dropping out. Nevertheless, the tutor, on realizing this problem, can attach course tutorial videos to the content to assist the participants in using the computer, in order to improve support and learning. The student who does not have experience with computer tools and resources that the internet offers is deemed unfit to study a distance learning course. However, this teaching mode was created to expand access to knowledge. Thus there is a contradiction as a student who does not know how to work with their computer is excluded from participating in the course. Therefore, the distance tutor should contact the classroom tutor, so that the latter can assist the student to use the basic features, such as access to audio and video resources; downloading; creating documents and sending them to the VLE, and also train students in the use of computer tools, so that they can take the course.

The tutor's actions should act to increase interaction among students: encourage them to have discipline and organization to continue learning autonomously, offer them aids to complement the course content and to encourage their curiosity. If a low participation frequency of a student within the VLE is verified, the tutor should immediately contact them. Tutor attitudes can have a negative influence they tutor do not respond to the student questions, if they do not make contact with students, or if they do not encourage interaction between students of the course. The intervention of the tutor can modify all the distance education proceedings, and thus they are the key to the success of courses of this type.

Some actions can be performed by the tutor to improve the teaching methods of distance education courses as suggested: tutors should be trained in order to understand the difficulties faced by students and to act to prevent or correct possible problems encountered during the implementation of the course. Therefore, a prepared tutor acts effectively and efficiently and thus reduces the cases of student dropout.

This research makes recommendations to prepare the tutor to address increasing informational demands in terms of the student's relationship with the VLE. These recommendations serve to support tutors by sharing the information found and validated by this research.

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