RESTRUCTURING OF DISCIPLINES IN STATISTICS BASED ON STUDENTS' EVALUATION IN ONLINE EDUCATION PROGRAMS

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This paper aims to investigate the contribution of a student evaluation of Statistics courses in the restructuring of an online degree. With the students' evaluation as a base, it was possible to make adaptations and changes to the organization and pedagogy of the courses. Discursive textual analysis was utilized to analyze the students' evaluations. Some modifications to the virtual platform were implemented to accommodate the symbolic and language characteristics of statistics classes.. These changes improved the virtual interaction between professors, students, and tutors. The discussions on virtual forums allowed the students to rethink their ideas, because of the contributions of peers, tutors, and professors. These reflections obtained through the virtual dialogues helped to build students' statistical knowledge.

INTRODUCTION

Statistics is gaining importance in contemporary society, since the volume of data that we have increases every day. This new reality, driven by the advance of digital technologies requires professionals from various fields to synthesize and analyze data. Technological advances are also promoting the creation of other educational activities that enable other forms of teaching and learning statistics. According to Batanero (2001) statistical education is as important for those who make decisions based on this information, as it is for the people who have their lives influenced by the information.

To Garfield and Ben-Zvi (2008), one of the reasons that make statistics a difficult subject to teach and learn is the fact that often, the focus of a course is on numbers, calculations and formulas. In this conception, according to Becker (2008), learning means the mechanical application of concepts without reflection on what they mean. To Vialli (2007), this didactic misconception causes the students' lack of interest, leading to no or almost no learning.

This scenario led to the development of this research, which aims to reflect on teaching and learning statistics in an online learning environment. This study was developed in two statistics courses, administered sequentially in an undergraduate online course at a university in the extreme south of Brazil.

BACKGROUND OF THE RESEARCH

Online undergraduate courses in Brazil were established in the 90s, with the expansion of the Internet in the university environment. In 2006, the Ministry of Education established the Open University System of Brazil (OUSB), formed with existing educational institutions, in partnership with the cities in order to expand the supply of undergraduate courses in the country and encourage articulation and integration of a national system of free public universities. The Federal University of Rio Grande (FURG) joined the OUSB system and provides two undergraduate degrees: Bachelor of Management and Pedagogy, which are offered in five centers of distance education located in the extreme south of Brazil.

The pedagogical organization of DE at FURG as well as other Brazilian universities was directly influenced by the OUSB system. In this model of education the teacher researcher is responsible for thinking, preparing and producing the didactic course material. The teacher trainer is responsible for teaching activities related to the development of classes using the material produced; the teacher conducts the evaluation, the mediation and the management of team actions of tutors.

The teacher trainer has the support of both distance and face-to-face tutors. The distance tutor, who operates in the same institution as the teacher trainer, helps to clarify the questions of the students through the virtual platform. The on-campus tutor meets students in face-to-face mode. To this end, the face-to-face mode support has a library, bureau, computer room, and video conferencing room (BRAZIL, 2007).

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The course also has a multidisciplinary team that has the responsibility to coordinate the educational activities and training of teachers and coordinators, to guide the choice of teaching materials, to set the visual standard equipment and video production, to carry out the logistics of distance teachers and tutors in face-to-face mode, among others.

Structurally the distance undergraduate courses are organized into modules, with three courses per module, with each lasting approximately two months. Communication between teachers and distance tutors with students is via Moodle platform, chat, forums or email.

METHOD

The statistics courses were taught by two university professors during the second year of Management. In Statistics I (SI), 75 students were taught the concepts of descriptive statistics and introduction to probability. Statistics II (S-II), with 70 students, involved inferential statistics. The subjects were distributed among six to seven weeks, with a face to face final exam in the last week. During the courses, weekly virtual assessments were held, which, according to Brazilian law, can compose up to 40% of the final grade, with the remaining 60% from face to face evaluations.

In the last face to face meeting of the courses, the students were invited to participate anonymously in the evaluation process. The evaluation instrument consisted of open questions in which students expressed their opinion about the course material, video classes, learning assessment process, evaluated activities, forums and work done by the teachers and tutors.

A qualitative approach guided this research, using textual analysis methodology (DTA). According to Moraes and Galiazzi (2007) DTA is the disassembly and reassembly of texts in order to examine the details of students' responses and establish relationships with the phenomenon investigated. This implies the recognition of different perspectives and, consequently, causes the researcher to consider, in addition to personal ideas, the multiple meanings conveyed in the texts of the research subjects, as well as the connection to the theoretical foundation.

The DTA cycle consists of three elements: unitarization, categorization and communication. It begins with the identification of meaningful units, which consists of removing the text in sequence; the categorization process reassembles the text through the relationships between the various units of meaning that were identified. In communications, the third stage of the cycle, the text summarizes the central argument in each category.

RESULTS AND DISCUSSION

First, we studied the profile of the students who participated in this research: 60% of students are male; 74% access the platform at least 5 times per week; 88% have a computer at home; 79% have internet access; and the average age is 32.1 years with a standard deviation of 10.3 years.

The open-ended questions were analyzed to evaluate the courses. From the data, four categories (Table 1) were identified in each course. To each of these categories one metatext presents the speech of students with the review of the literature and the theory that underlies this research. In this paper, we discuss the last two categories found by DTA in each discipline: Face-to-face Meetings and Virtual Dialogues.

Table 1. Categories identified in the disciplines

Discipline of Statistics I	**Discipline of Statistics II**
Handouts	Handouts
Pedagogical actions	Pedagogical actions
Pedagogic coherence	Pedagogic coherence
In-Person meetings	Virtual dialogues

During the course of S-I, two meetings were held with the presence of the teacher and tutor in the distance classroom mode. The meetings that occur at the poles are important moments for both the teacher / tutor such as for students who are being initiated into the culture of online learning. Most often, these meetings have provided opportunities to intensify relationships, both personal and professional but also affective that contribute significantly to the process of teaching and learning. According to Maturana (2002) how we learn depends on the emotions and, therefore,

the teacher's role in education is to guide this process, creating a space for experimentation and dialogue in which students can build their knowledge.

Although students are aware that the course is offered in distance mode, in the evaluation of S-I, they requested more face-to-face meetings because they considered that two meetings were insufficient. To solve the need of physical meetings, virtual dialogues were encouraged in the following course. In the case of the course of S-II, along with other platform tools such as forums for discussion, where, in addition to tutors and teachers, the students themselves could assist their classmates. The discussions in the forums also enabled greater interaction, providing opportunities for students to overcome a fear of exposing themselves to presenting their ideas in writing. They know that their work will be read and questioned by others (Kenski, 2003).

The socialization and cooperation in addressing the difficulties by virtual dialogues were important as noted by student E31, "The forums are great questions, because we found many of our doubts clarified with the support of classmates." The forum allowed students to retake their placements regarding the studied contents of statistics, which led them to reflect on what they had studied, modifying or adding new information throughout the process. According Kenski (2003), the educational activities in virtual environments need to be supplemented "[...] with actions that take people's isolation and forward them into group activities, where they can act collaboratively" (p. 112).

According to Campos, Wodewotzki and Jacobini (2011) a particular feature of statistical thinking is to provide the ability to see the process in a comprehensive way, understand their various interactions and the whys, the significance of variations, exploring the data beyond what is laid and generate aspects not initially foreseen.

According to Castells (1999) a network society demands greater autonomy of students, enabling them to organize their study time, developing skills and attitudes, allowing students to create possibilities for the production of their knowledge. The ability to discuss statistical concepts and participate in discussions with classmates promotes the integration of the learning process, and encourages and supports cooperation, because, according to Ara (2006) this is what occurs in professional life.

Another challenge faced by both the students and the staff of teachers and tutors was that the discussion forums on topics such as probability, hypothesis testing, confidence intervals, and regression analysis did not have the symbols and nomenclatures characteristic of the language of statistics. In dialogue with the multidisciplinary team this difficulty was solved.

In the face to face poles in which the group of students actively participated in the discussions boards, exposing their questions and contributing in discussions about the developed concepts, there was a larger approval rate than at the poles in which students mostly were absent from this thread, isolated from the collective debate (one pole came to present 100% approval). As stated by two students in the assessment process: "It is good to see that not only we have questions, and also good to hear the comments of classmates" (E15), "The forums have been very productive, because through these we can clarify many questions" (S24).

Kenski (2003) suggested there must be involvement in various types of interaction and communication with the support or not of digital tools, but for this interaction to occur, there must be involvement. As stated by one of the students, "Statistical distance is difficult, this could only be overcome due to the efforts of the team." To provide this necessary integration of the teaching staff, two weekly meetings were held between the teachers and distance tutors in which they discussed the content and activities to be worked on next week as well as the difficulties that students faced during the current week. These meetings enabled dialogue between the staff to exchange experiences, ideas and discussion of the solutions, which was noted by the students in the evaluation of the course S-II.

The use of the platform and its tools for online interaction in the discipline of statistics were essential in promoting dialogue among teachers, tutors and students, which enabled a shared practice among professors who teach and those who learn, thus establishing a process of production of meaning that makes the students able to build their own journeys in learning statistical concepts.

CONSIDERATIONS

One of the major changes that the evaluation process made possible relates to overcoming the need for physical meetings, given that work was undertaken in order to encourage interaction through virtual dialogues between students, tutors and professors. In particular, in teaching online statistics, the interaction provided by the virtual dialogues, constituted an opportunity to clarify doubts and exchange of knowledge and overcoming the difficulties encountered in understanding statistical concepts. This understanding is often difficult to achieve in individualized study due to the physical separation between students, professors and tutors.

The discussion space built in the virtual environment contributes to the development of students' ability to discuss and reflect on statistical concepts, to participate in discussions with classmates, stimulating and supporting the cooperation, to overcome the fear of exposing themselves when they present their ideas in writing. Only then, we will be contributing to the training of future professionals to develop their skills to function in a networked world.

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