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Online Teaching: An Easy and Smooth Transition from Traditional Classes to a Virtual Environment in Computer Science Courses

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Abstract: The current Pandemic has brought new challenges regarding the transformation of classroom presence into a virtual environment. This transition, despite being the only solution for a fast and strong commitment to the continuity of teaching, was somewhat difficult for some students, teachers and educational institutions. However, this transition was not difficult for everyone. Computer science-based courses, when compared to other courses, have not suffered the same consequence, due to teachers and students are somewhat used to working with 100% online work tools, given the nature of the course and the curricular units that comprise it. This article is intended to demonstrate through practical examples that the transition to the virtual environment, to computer science-based courses, was smooth and quick to adapt by all involved.

Keywords: *Online teaching, traditional classes, virtual environment, computer science, online tools, frameworks, learning management systems (LMS).*

I. Introduction

Nowadays, and due to the pandemic situation, that has devastated the world, government entities in most countries have been forced to cancel any activity, regardless of its nature, in which interpersonal contact is predominant and frequent. As a result, presential education was no exception and schools, colleges, universities and other higher education institutions were forced to close their doors to mitigate the transmission of the new disease. This situation has brought many problems with the transmission of knowledge. But one thing was evident to everyone *"Schools may stop. Teaching does not."* This statement was (and is) in the minds of many educational institutions, where they promptly began to try to find solutions that would allow teaching to go ahead even though their doors were closed. The only solution to implement in such a short time, to reduce the absence of classes, would be to transform the traditional classes into virtual classes: known as online teaching. It was the solution accepted by most educational institutions as it did not interfere with the rules imposed by government entities. Despite having been the solution that would quickly respond to the current problem, this solution has also brought issues regarding the capacity, availability and effectiveness of all the surrounding "entities": students, teachers and educational institutions.

What was also (and is) true is that not all institutions had problems, not all students, not all teachers. It depends on a large part on the nature of the course, the training of the teachers and the capacity of the institutions to adapt to this unexpected transition. Courses previously adapted to distance learning, such as those related to computer science, were probably those that

suffered less in this process, and the explanation lies in the way these courses were taught in the presential model, in which many of them already had a strong bet on the online component and the interactivity between teacher and student.

This article is intended to give an overview of the transition from presential classes to a virtual classroom environment, in computer science-based courses, and how smooth this digital transformation was for courses where the knowledge of tools for working 100% online was already known and applied in several curricular units of these same courses.

II. Online Teaching Transition and its Problems

The transition from conventional to online model classes has generated new problems and new challenges that needed to be overcome almost in real-time to respond quickly to the forced interruption of teaching. These challenges, which many see as problems, have introduced new working methodologies for both teachers and students, as well as new adaptations by educational institutions to continue their students' study cycles [1]. These challenges can be classified into three main categories, in which we considered the authors to have been the most highlighted in this process.

- Response Capacity
- Resources Availability
- Teacher / Student Training

III. Methodology

During the Pandemic, the adaptation of courses related to Computer Science and other scientific areas was quick and efficient thanks to the set of tools already in place that allowed an easy transition [2-5]. First of all, it was necessary to convert the rooms into virtual rooms and to place all the programmatic content available online something that was already a common practice in most educational institutions. Blackboard Learn [6], Moodle [7] or Google Classroom [8] present themselves as excellent platforms for quickly placing program content online and also allow students and teachers to gain access to an organized environment of easy interaction. Many universities are using Moodle and Blackboard Learn before the outbreak of the Pandemic, which has allowed students to be most familiar with the platforms.

It was also remarkable the improvements that these applications developers made throughout this period with constant updates that offered new features to speed up the whole process.

Another critical step was to convert theoretical lessons into virtual lessons using software with Zoom [9], Hangout Meets [10] and Cisco Webex [11] among others. This software was used throughout the Pandemic by thousands of schools and universities around the world offering students the classes that were once face-to-face at a distance, thus forcing them to maintain a routine and still giving them the possibility to review the classes if the teacher so wants. The advantages that were brought were the access to theoretical explanations challenging to explain with only reading content, and there was also the possibility of recording the sessions thus allowing in the future the visualization of them avoiding the students to miss the classes that they could not attend. Nevertheless, it also had its disadvantages as the notorious lack of attendance of students and the insufficient attention of some due to the absence of the teacher which made the overall performance lower, something that could change in the future with their adjustment to the new reality.

In Computer Science courses, the programming units were more difficult to adapt because they require some work on the part of the student and a follow-up by the teacher during it is crucial for doubts clarification. However, this barrier was also overcome with the help of specialized software with Github Classroom [12] that allowed students to check their code in obtaining real-time feedback even as if they were in a classroom to facilitate the learning process and the autonomous work of the student.

IV. Results

Students' acceptance was good, and the final results were reasonable and above the expected. In figure 1 are presented the grades obtained in the first phase of two subjects taught in the second semester to the Degree in Computer Science at ISTEC, Internet Technologies II and Programming V. The results obtained were lower than last year, but not much lower comparing the average score of 60 students to each of the subjects when comparing this year's scores with the previous year. The lack of presence of the teacher also led to the indiscipline of some students something that could be bypassed with the mandatory use of the camera during classes and greater control of attendance in online classes, however, in most cases, the students' feedback continued positive, and they enjoyed the applied methodology.

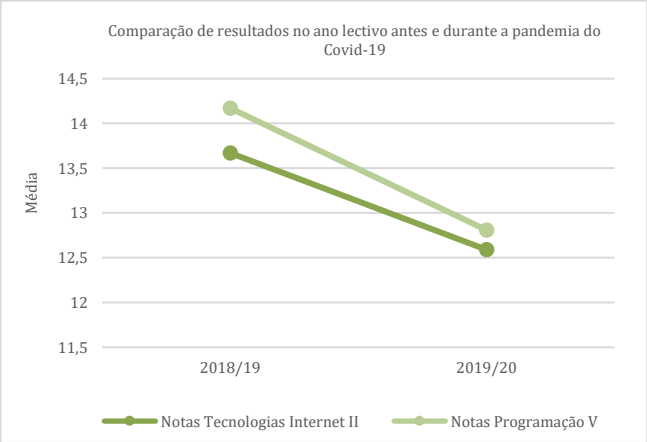

Fig. 1 - Chart of the grades attained in the 1st Phase of two chairs taught at ISTEC

Students have fully understood the mechanisms for submitting papers online, and teachers have also generally adapted well to this new reality. However, it is already common practice in most universities before the Pandemic and the entire transition to distance learning. As shown in figure 2, most of the students chose the continuous evaluation where they had to submit their work through the Google Classroom platform and run it at distance without being present in a laboratory with the presence of the teacher as in previous years. The online work submission also allowed the teacher to control plagiarism more quickly because it is possible to use software for this purpose. The final evaluation was possible to be carried out in person in some cases, in other software was used. In our particular case, we used both types of face-to-face evaluation at the end and online during which we maintained two components of ongoing assessment and put the exam, in which we ongoing evaluated the software laboratories using the tools presented in this article and in the exam we resorted to a face-to-face examination following all the required standards.

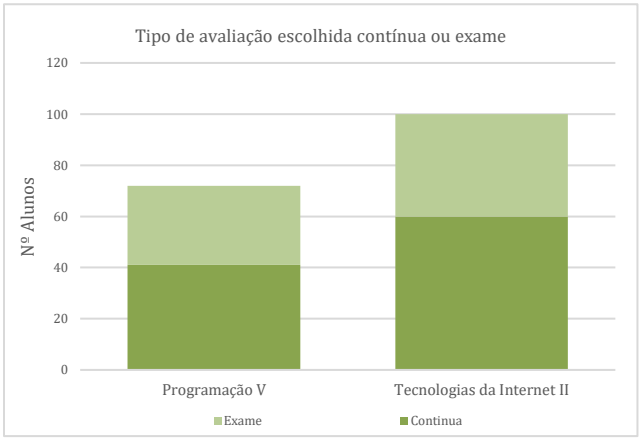

Fig. 2 - Bar charts for the type of evaluations chosen by students for two chairs taught at ISTEC.

V. Conclusion

The transition and adaptation were necessary, and the response of all academic staff was almost immediate if the Pandemic was overcome and teaching remained available to students as it should be. They have overcome the difficulties, and the final result was good. However, distance learning has not ended and has allowed thousands of students around the world, not to lose nearly a year. With the software tools available, the transition was not as difficult and allowed everyone to test the concept of distance learning. In conclusion, we believe that the transition in the areas in which we had direct contact was smooth, and our students have adapted quickly to the new reality. In future, we believe that additional software tools will emerge and that distance learning may become increasingly common, at least in higher education.

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