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Learning Of Algorithms On Mobile Devices Through Bluetooth, Sms And Mms Technology

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Abstract

Teaching Institutions are up against challenges of an advanced technology of learning with the objective of improving the efficiency of the teaching-learning process. Joining the students' learning style to the technologies is important to improve the educational process. This work presents the advantages of using mobile devices, associated with the students' learning styles. The learning which is carried out with the use of mobile devices makes it possible for users to learn at anytime and anywhere.

1. Introduction

The use of ICTs in the teaching of algorithms was made possible through the supervision of the teaching-learning process of this subject at Instituto Federal Fluminense, in Campos dos Goytacazes, when it was able to verify the huge difficulty experienced by the students.
There is consensus, among the teachers of the area, that it is not enough to present an algorithm in an explanatory way on the board in order to be able for the student to comprehend it completely, and to create similar or derived algorithms from that, neither to become capable of resolving problems with these instruments [1]. This work presents the use of mobile devices to the teaching-learning process of algorithms. In this work, it is related an experience in which it was explored another way to transfer learning material to students' mobile device, using the wireless technology called Bluetooth and SMS.
[2] states that mlearning can be defined as learning through the use of devices and the wireless technology. According to [3], this learning through mobile devices (Mobile learning) is observed due to the fact it is without the permanent physical presence within the educational process.
According to [4], the future educational applications and services will need resources to make it easier its use, like: to download materials in different types of format, text, voice and video, to "run" without the use of adaptations, as well as to make feasible the reduction of the cost of access to the Internet because the characteristics of the functionality of the devices differ from manufacturers.

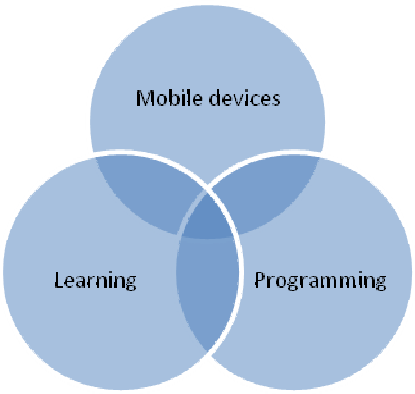
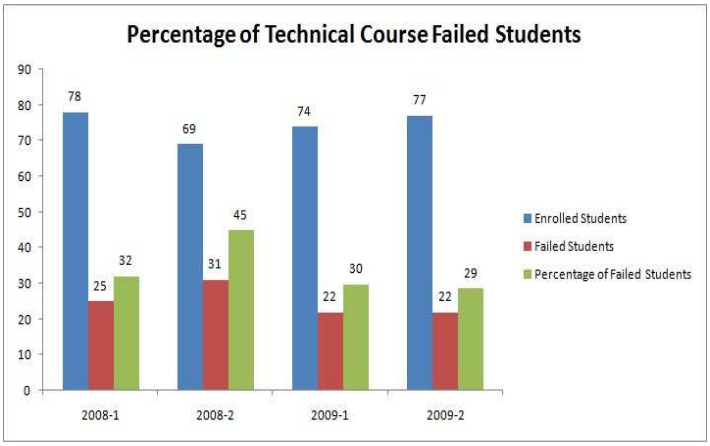


Figure 1 -The convergence Technology and Education

Fig. 1 shows the investigations of this work, which embody the programming subjects, in particular in the learning of algorithm, the learning styles, in particular the students' ways of learning, as well as the mobile devices technology, besides the insertion of the mobile technologies for the learning

refinement. The intersection of these areas is investigated in the teaching of algorithm and corresponds to the way how the students learn by using technologies.



Graphic 1 - Failed ones in Algorithms

Graphic 1 shows, in the semesters 2008-1 to 2009-2, the percentages of failing in the Computer Science Technical Course, from 2008-1 to 2009-2, the average of 34% of the failing of algorithm students. This has become a motivation for an investigation work aiming at the improvement in students' learning.

The reasons for this high level of lack of success are not specific ones of the area. In general, [5] and [6] observe that the students do not present self-assurance in the organization of reasoning, elaboration of strategies for solving problems, attention, concentration, stimulus to the process of mental calculation. Thereby, the skills involved in this process, such as trying, observing, conjecturing, deducing, and that constitute what we call logical reasoning, not being appropriately developed, they interfere in the learning of practically all cognitive areas, but, especially, they affect this area of knowledge.

2. Objective

The objective of this work is to make it available, through the Bluetooth technology, the pedagogic materials of algorithms to the mobile devices. In parallel, the students are registered by their cell phone number so that they receive short texts and messages through the SMS. Texts are sent to absent students from presential classes, informing them about the topics taught in presential lesson and assignments to be developed. Also it was used the sending of educational objects by MMS.

The use of this learning way is considered, in this work, as being a support to the classroom lesson. Various peculiarities are important in the learning process of algorithms as it follows: i) coherence with the fundamental objectives of algorithms and that the teacher must build in the operationalization of this learning for the students: ii) to highlight the critical thinking, a care to be observed, because the students own little experience in the resolution of problems involving mathematics and tend to believe any demonstration. This kind of behavior must not be stimulated.

It is essential that the students have critical thinking on any resolution of problems and are stimulated to obtain new solutions for the same problem. It will be from healthful doubts and of a new resolution and perception that the importance of the theoretical work will be presented. iii) the theory put into practice.

That group of factors is the one that makes it possible the improvement or the lack of success of the learning. First of all, it is essential to comprehend what an algorithm is. Its definition becomes, thus, important to have a perfect comprehension of these peculiarities, because the algorithm is a sequence of instructions in order, without ambiguities, presented in a logical way for the resolution of a determined task or problem. The algorithm is a mathematics formulation, a piece of code, and finds itself located between the input and output to transform the first into the second. It is the way for the solution of a problem and, in general, through these ways several solutions can be obtained.

3. Methodology

Using MLE, Bluetooth and SMS – In stage 1, the construction of a quiz (questions) about algorithms with images and sounds using the MLE (Mobile Learning Engine) was the solution presented in this work. This system is open source (code free font); free of charge and with capacity of personalization, and the access to MLE by cell phone is done through Bluetooth technology. The MLE is available in two languages, as it is shown by following the items: i) Didactic Material: It constitutes of a set of pages, ending with a question with answer alternatives. ii) Quiz: It is a multiple choice test, true or false, and questions of short answers. Each attempt is automatically checked and the teacher can choose by which way the interaction with the student will occur, i.e. the answers will be sent, or to present the right responses to the immediate student's correction.
Learning objects – shaped like videos – were sent and made available to the students with the following topics and time duration: i) introduction, time – a minute and six seconds; ii) types of data, time – two minutes and thirty-six seconds. The use of SMS technology in this project was used in various categories. Three categories of themes to send SMS messages by cell phone were selected. 1. Administrative Messages; 2. Pedagogic Messages; 3. Motivational Messages.
The work had as a return text messages sent by SMS, by phone-call or by e-mail. The learning object constructed to be used on mobile devices demanded a series of observations like: size of characters, colors, sounds, among others. The sequence of Fig. 2 presents the contents on the mobile device.

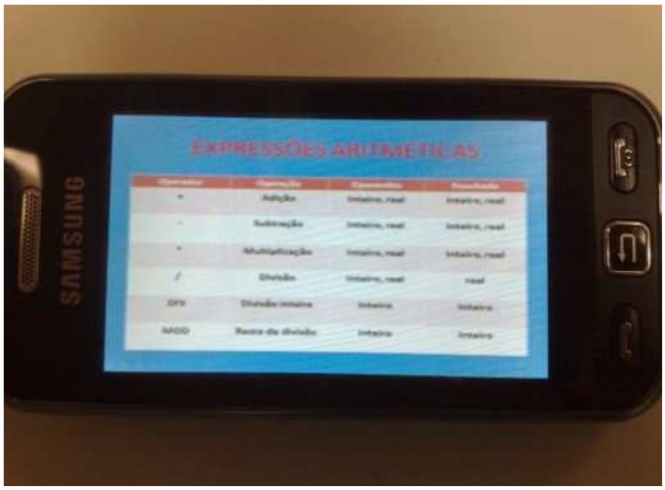


Figure 2 - Data types

Besides this technique of videos with contents of algorithms, demonstrative videos of functioning were produced using one of the techniques called Table Test, that consists of following instructions of the algorithm in a sequential and accurate way, storing the possible values of the variables to verify the procedures used in the designing of the algorithm.

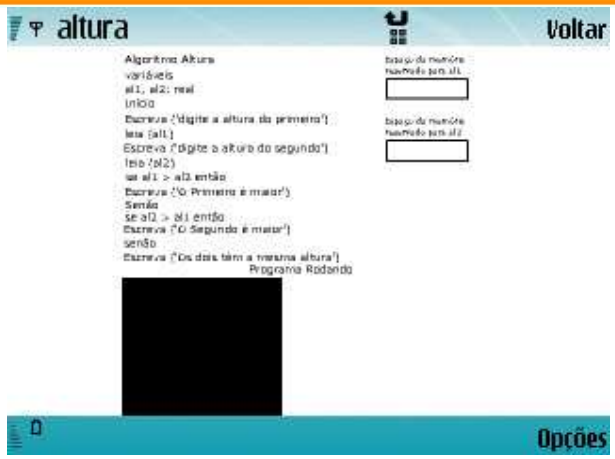


Figure 3 - Table test

Fig. 3 show the construction sequence of the table test. This test makes it possible to compare the results to the objective of the algorithm and the possible errors during the execution. The teachers also use them in learning environments through the web. It is a technique which prioritizes the visual perception.

5. Results

With regard to the male students' learning styles, only one with visual and kinesthetic learning style as well as male student with preference to the auditory learning style did not obtain approval. Concerning the female students' learning styles, only one with visual and kinesthetic learning style as well as male student with preference to the auditory learning style did not obtain any approval. The failed students were interviewed and reported that the experience regarding the knowledge of their own learning styles was beneficial to the learning and attributed the weak performance to extra-class problems, because they missed the examination. Though, they even reported that would like to keep on in the process and be re-evaluated based on the support with educational objects. Graphic 7 shows the result in the subject of Algorithms of the students of the Computer Science Course in the year 2010-1 that the performance was satisfactory, because in the year 2009-2 the index of failing was of (29%) and in the year 2010-1 this index was of 13%.

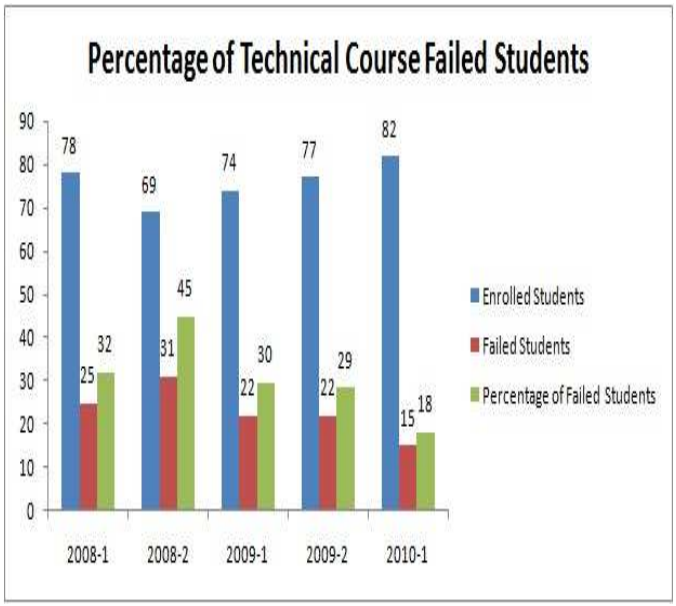


Gráfico 2 - Performance and algorithms 2010-1

Through accounts, the students attributed to the satisfactory performance in this subject several factors, as it follows: i) the use of mobile devices making it available the access to the course content, what enhances the motivation and learning opportunity, as the performance shows. Besides, since the students achieved the success and progress through exercises, they state that they have being motivated to learn more by the use of pieces of technology; ii) Another factor was the strategy of learning of algorithms in an individual way made possible by the convergence of information and communication technology with the strategy used; iii) the learning of algorithms through the opportunity of interaction among the students. The availability of the learning objects must include the opportunity for the students to interact with other students and with the teacher in order to report the difficulties and the solutions found in the resolution of the proposed problems.

6. Conclusion

The use of mobile learning in the teaching of algorithms led to a significant improvement on the students' performance, because it made possible the collaboration, giving a good opportunity for the support of multimedia such as videos, graphics. The learning through the mobile devices in consonance with the students' learning styles, as well as their motivation with the insertion of this technology made the teaching of algorithms more attractive and, consequently, made it possible to improve the learning.

Regarding the fifteen level 1 students, fourteen students participated actively of the assignments and thirteen obtained approval without need of a third exam to be retaken. It can be, therefore, stated that the experience contributed to the development of the logical thinking and made it easier the supervision of the academic trajectory. It was verified in these students the improvement of the abstraction, of the logical reasoning and of their learning performance, confirming a differential with regard to the ones who did not take part into the project, even though, evidently, other factors can also have interfered into the learning.

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