THE USE OF MOBILE TECHNOLOGY IN EDUCATION

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Resumo

O objetivo do projeto foi a utilização das Tecnologias da Informação e Comunicação, em particular as caraterísticas de dispositivos móveis na renovação dos contextos de aprendizagem.

A abordagem pedagógica utilizada foi a mesma em diferentes atividades e envolvem três etapas principais:

1. Os alunos recolheram dados geo-referenciados em tempo real num certo contexto com a ajuda da tecnologia móvel;
2. Os dados foram tratados, pelos alunos, nas aulas, com a ajuda de software específico e foram construídos gráficos interativos;
3. Os gráficos interativos foram utilizadas para estudar, com a ajuda dos professores, as informações obtidas nos diversos assuntos estudados e foi aplicado o conhecimento teórico adquirido, pelos alunos, para compreender os resultados alcançados.

O projeto desenvolveu atividades como: a) Geo-referenciação de caminhos para a recolha de variáveis ambientais; b) Tal como para a recolha de parâmetros biométricos em atividades desportivas; c) Estudo de movimento de objetos através do lançamento de foguetes.

Palavras-chave: Contextos educativos, mobilidade, pensamento crítico, tecnologia, GPS, sensores, logbook, informação gráfica.

Abstract

The aim of the project is the use of Information and Communication Technologies, particularly the features of mobile devices in the renewal of learning contexts.

The pedagogical approach used was the same in different activities and involve three main steps:

1. The students collect and geo-referenced real-time data in context with the help of mobile technology;
2. The data was assembled by the students in classes, with the help of specific software and there were built interactive graphics;
3. The interactive graphics were used to study the information in those different subjects and the theoretical knowledge was applied by the students to understand the results achieved with the teacher's help.

The project developed different activities like: a) Geo-referenced pathways for collecting environmental variables; b) Geo-referenced pathways for collecting biometric parameters in sport activities; c) Study of moving objects with rocket launches.

Keywords: Educational contexts, mobility, critical thinking, technology, GPS, sensors, logbook, graphical information.

1. INTRODUCTION

Currently, we live in a society where technology is increasingly a most significant importance in day to day life of every citizen.

The school as a mean of socializing children cannot alienate the use of educational technology resources in classrooms, because using them mean harness it's potential as a fascinating and educational motivator of students and teachers, taking always into consideration the dynamics of learning (SARMENTO,1988). Also according to Sarmento (1998), the Educational System, wants to take, as the main concern, the people´s formation with the development of critical and creative skills for an inclusion in today's world. Mastering Information and Communication Technologies (ICT's) becomes paramount issue in the education of our students.

The ICT´s have been set up not only as a tool for the teaching - learning, but mainly as an instrument that provides the representation and communication of thought, update it continuously solve problems and develop projects (CORREIA, 2004).

According to several authors, the use of ICT's can promote coordination between various areas of knowledge and provide a depth of some specific content. It can also encourage the production of new knowledge, make teaching more interesting and relevant, providing more time for observation, discussion and analysis of data, as well as generate more opportunities for communication and collaboration.

According to Correia (2004): "ICT's have, thus, the potential to make education more attractive. This reality arises only if given the opportunity for students to engage in meaningful and authentic activities and / or respond to challenges and problems".

As Adell (1997), in Correia (2004): "ICT's is no longer an educational tool at the service of teachers and students ... they exist and are growing in the world where we teach young people ...", also according to Adell (1997): "They follow the life cycle of our youth, but for this purpose it is necessary to make a continuous effort in curriculum development and evaluation research".

The miniaturization of technologies and its potential for connectivity, allows us, today, using equipment such as PDAs, smart phones, GPS, sensors, among others, with features until recently, reserved exclusively to the traditional PCs or laptops (including

reading common file, programs execution, Internet access, images and video capture, communications and geo - global positioning system (GPS). This rapid revolution of technology has been associated by costs reduction and provides the democratic access of the ordinary citizen.

1.1 The origin of the project and the implementation

In recent years, in Portugal, has seen an increase in the use of ICT for the teaching – learning process. Recently, from an initiative of our knowledge center CCEMS, in dialogue with some technicians and schools teachers, the project that use mobile technology in education, so called "GO - Mobility in Education" was born.

The project resulted from the collaboration of the knowledge Centre (CCEMS), the Department of Curriculum Research and Development of the Ministry of Education (DGIDC) and Rainha Santa Isabel School from Leiria among other schools.

The implementation of the project was structured in four main stages: 1) analysis and evaluation of the potentialities of the equipment (software and hardware); 2) teachers training in the context of the technologies used; 3) classroom implementation (realization of curricular and extra-curricular activities with students); 4) evaluation of the project. It should be noted, that the project is developed into three main areas: Geo-referenced pathways; Science and environment analyzes with mobile devices; monitoring human body in sport activities (curricular and extra-curricular activities also).

The GO project initially developed in the form of pilot project, involving a small number of schools (15), in an initiative that lasted three years (2008-2011). Because of the initial success, the project was extended to more educational establishments being included in the phase GO 2.0.

1.2 Objectives of this project

The aim of the project was the use of ICTs, particularly the features of mobile devices (GPS, smart phone/PDA, logbook and sensors) in the renewal of learning contexts. The subjects involved were, Natural Science, Physical Education, Mathematics, Physics and Geography.

There were some main objectives, such as:

- Renewal and enrichment of learning contexts, with the help of mobile devices;
- Give students a central role in the development of multi-disciplinary skills;
- Improve students results and ICT skills;
- Increase students motivation;
- Development of experimental teaching in context (real observation of phenomena);
- Promote interdisciplinary work, sharing materials and knowledge.

1.3 Used technology

In this project we used:

1) Hardware: ScienceScope logbook (Logbook GL); Environmental sensors; Air compressor launcher and Rocket (with sensor) and Heart Rate sensor; GPS (Garmin eTrex Vista HCx); Digital photo camera and Computer.

Fig.1. A- Computer; B- GPS; C. Logbook; D. Heart Rate Sensor; E. Rocket and Sensor

A. B. C. D. E.

2) Software: Microsoft Excell; Word; PowerPoint; Internet Explorer; Northgates kml editor; Google Earth; Google Maps; Bing Maps; Sciencescope Datadisc PT; Jdata3D; Rocket Tracker.

1.4 Educational community involvement

In the three years of implementation of the Project, we had about 200 students involved in the several activities protagonists between the ages of 10/14 years and 10 teacher's help to develop the project.

Two classes of 40 students were involved in the assessment made by questionnaires that identified the project impact.

1.5 Pedagogical approach

The pedagogical approach used was the same in different activities and involve tree main steps:

- The students organized in workgroups collected and geo-referenced real-time data in context (ex: environmental information, heart rate variation) with the help of mobile technology;
- The data was assembled, by the students, in ICT classes, with the help of specific software (from Sciencescope) and there were built interactive graphics. This graphics can be visualized in 2D/3D platforms (Google Earth, Google Maps). The information was shared in the school community between teachers form different subjects;
- The interactive graphics were used to study the information in those different subjects. The theoretical knowledge was applied with critical think, by the students, to understand the results achieved with the teacher's help. The final results were shared on-line.

2. ACTIVITIES DESCRIPTION

Under this project we developed three types of activities. All activities emphasize the use of mobile technology (ex. GPS, sensors) and give students a central and active role in the development of multi-disciplinary skills.

2.1 Activity 1 – Study of human heart rate in context

In this activity the pupils study the concept of heart rate and its variation with intensity of exercise. Students accompanied by teachers held a bicycle trail. During the journey were monitored three variables: heart rate of pupils; altitude and the scrolling speed. To collect this information was used a heart rate sensor (placed on a student chest), a GPS with an altimeter, and one logbook (interface for data collection) in the bicycle frame supported.

Fig. 2. Images illustrate the activity and 3D graphics projection of route taken, and variables collected during the journey visualized in Google Earth.

The data was registered in the logbook and at school with the help of the ICT teacher and the use of specific software the amount data was assembled to generate a kmz file with all data. This information can be interactive and was visualized in a graphical way in a 2D/3D platform (Google Earth). The final product was used in the disciplines of Physical Education and Natural Science to study the cardiovascular system and the processes of developing and maintaining the physical condition of a contextualized way.

Activity 2 - Geo-referenced pathways for collecting environmental variables

In this activity the students were engaged in making some geo referenced pathways near school with the help of the GPS, collecting environmental data like air temperature humidity, light intensity, fresh water sampling from a small river, water temperature, pH, dissolved oxygen among others parameters by the use of portable sensors. The data was processed the same way of activity one, and was analyzed by different subjects like Natural Science, Mathematics and Geography.

Fig. 3. Field and laboratory observations made by students, the sensors used and a pathway marked by GPS.

This activity aimed to study some ecosystem features with the corresponding geo - positioning of the data collected. The data, analyzed in context, made possible the student's reflection, critical thinking and comparison with theoretical concepts related to different subjects. The student's main role in this particular work brought them a new learning experience and significant knowledge building.

Activity 3 – Artistic paths Rocket and Geoart (rockets, forces and movement)

In this activity students study the objects movement, built some rocket model's, and made some simulations in web games. The simulation was available on-line: http://phet.colorado.edu/sims/projectile-motion/projectile-motion_en.html.

Then, with an air compressor rocket, they made some launches in different directions and with different strengths. This rocket had inside a GPS and a sensor that recorded the position, altitude and speed of the rocket during the flight paths made. The data was processed in the same way from activity one, and activity two, to generate a kmz file with all data. This information was visualized in a 2D/3D platform and was analyzed by different subjects like Mathematics, Physiques and Geography. It should be noted that this graph view is interactive and can be manipulated on Google Earth (Fig. 4).

Fig. 4. Images illustrate the activities and 3D projection of the rocket launches in Google Earth.

With the simple use of the GPS the students made some calculations to transpose our school logo, from the paper to the field, making a big logo that can be observed in Google Earth like a giant satellite symbol. This is called Geoart and is more one example of the application of Mathematics knowledge to the Art design.

3. ASSESSMENT RESULTS

To identify the project impact in the community and the level of student learning benefits, from the use of this technology, we made two kinds of assessment:

- The level of satisfaction about the proposed activities (targeted to students and teachers);
- The Impact of methodology adopted on student learning (targeted only to students).

In the first evaluation, the students involved in the project answer a questionnaire about the level of organization, the dynamic environment used, the expectations about the activities, and the usefulness of the activities. The results were good and encouraging the permanence of the application of this methodologies. In a scale of

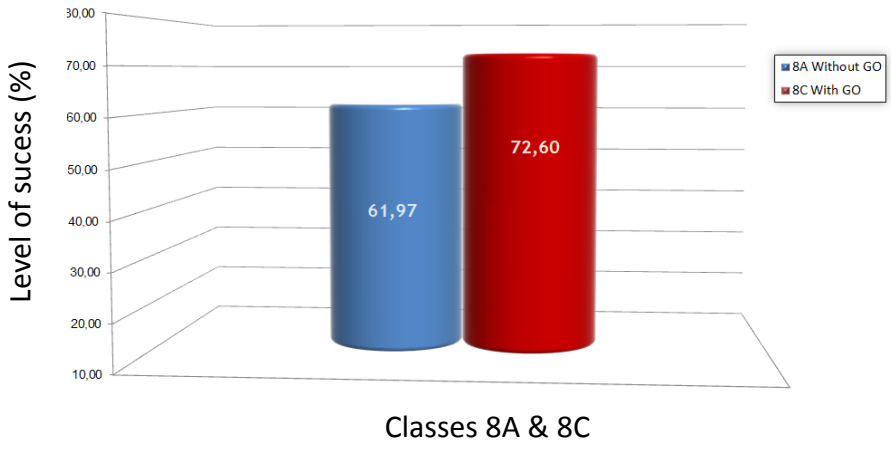
(Weak; Insufficient; Sufficient; Good; Very Good), the average results centered in the "Good" position.

In the second evaluation we choose two classes of students, involved in the first activity, to submit for examination by making a questionnaire about the same subject (heart rate and physical activity). The two classes of the 8º grade (8A and 8C) had about 20 students each, with 13 years of age. The 8A class usually had better school results compared with the group of 8C students. In both classes was carried out theoretical presentation of the subject curriculum on heart rate and physical activity, furthermore the class 8C was selected to participate in the practical activities of project Go, with the use of mobile devices, for monitoring the heart rate and physical activity. In addition to the theoretical explanation, the 8C class performed all phases of the project (data collection, data processing and graphical analysis of the results). For this 8C class the theoretical concepts were experimented in a real situation.

After this work both classes were submitted to evaluation, making a simple test with multiple choice questions. The aim of this test was to identify the level of understanding the information about heart rate and physical activity.

The results point to interesting data, the class usually with weaker results (8C) had an average 10% higher (72.6%) in its performance, compared with the class that only had the traditional theoretical approach to this topic (8A) with only (61.9%), as we can see in the graph (Fig. 5).

Fig. 5. Level of success from the test results for both classes 8A (in blue) and 8C (in red).



This was an example that demonstrates the role of implementing this technology in the context of academic success. The strategy used in this kind of teaching can be an important contribute in the renewal of the learning practices.

4. REFLECTIONS/ CONCLUSIONS

With this work we can identify and reinforce some ideas.

The use of ICT in the educational context, led to the creation of a motivating work environment.

Students showed marked levels of attention, concentration and commitment, they also become actively involved in the proposed tasks and demonstrate autonomy and ease of use of equipment.

The great appetite of young people by the use of new technologies was an advantage in implementing this project, its acceptance was consensual and paved the way for rapid learning as well as the methodology used provided an enrichment of the learning environment, facilitating the acquisition of curricular and non curricular content. The data obtained was a promoter element of discussion and reflection on the knowledge of the environment. These data put sometimes in question the conceptions what we had about reality that surrounds us promoting the students critical think.

The mobile devices used have proven to be capable of real time processing large amounts of information, representing it in a graphical way with interactivity, easy to interpret.

The results of our work emphasizes that the use of the new technologies in an educational context, may be managed as an asset for the quality of education, as well as promoting new educational practices in almost all disciplines. You can find more information about the project on-line: http://bit.ly/project_go

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