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## Education working group management using digital tablets

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### Abstract

Group work in education is a standard way of teaching, but is not always provided with the proper tools for being carried out. This work aims to explain a teaching group management model using Digital Tablets. A selection of applications was made for efficient managing of the work's coordination between group members as well as between them and the teacher. During the year 2011-12, a pilot study was carried out with graphic design as a subject involving students from the Computer Engineering and Agricultural Engineering degrees at the University of La Laguna. During seven weeks of the semester, the total number of students was divided into 30 groups that had to perform different graphic projects. The double aim of this methodology is monitoring the work of each group through TeacherKit app for iPad and improving the coordination, collaborative work and communication with the teacher using Dropbox as a common space for all members of each group and the teacher. For complementing the review process another two apps have been also used: LogMeIn and Notability. This work details the experience and some preliminary results from student's satisfaction.

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### 1. Introduction

In the educational system convergence processes, the acquisition of skills has become quite important. These skills are defined as the result of the learning process which allows student answering to the society's demands. Among the skills that are subject to being developed for accomplishment of this task, we may find the ability to work in groups and the use capabilities about the information and communication technologies (ICTs) (Commission of the European Communities, 2006; Guitert, Romeu, & Perez-Mateo, 2007)

Having this in mind the development of teamwork skills, since the appearance of the new engineering degrees at the University of La Laguna, the course of Engineering Graphics (during first year of the new degrees) includes in its teaching methodology a practical work of graphic simulation for an engineering project. This work must be performed in groups of three to five members representing a 30% of the final score.

During the 2011/2012 academic year, at the Computer Engineering and Agricultural Engineering degrees held at La Laguna University, such work has lasted seven weeks (almost half of the time assigned to practical lessons in the

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whole semester). Each group must create a minimum of ten planes in pdf format, as well as an Autodesk Inventor assembly and a video summary comprising all work.

Furthermore, the New Media Consortium & EDUCASE Learning Initiative (Horizon Report, 2012), identifies the technologies that will be widely used in schools in the forthcoming years. For a one-year period all applications for mobile devices and tablets as digital technologies subject to implementation are detected. It is clear, that within educational environments, the use of digital tablets is becoming increasingly popular due to their mobility and educational opportunities characteristics, (Saorín, de la Torre, Martin-Dorta & Carbonell, 2011). It is important to point out another emerging technology such as cloud computing which, among other things, allows access to educational contents from everywhere using any device's Internet connection (Sultan, 2010).

Because of this, in this work, the teacher will use digital tablets and cloud computing for monitoring and controlling the teamwork. Although all the exercises proposed to students have a common scheme, each group can choose the designed object. Therefore, every group is working in a project quite different to others. So, there were many needs for coordinating different groups. They can be grouped into three different ones:

- A common environment where work is collaborative, among members of the same group provided with teacher's support. This environment should be accessible from different devices and platforms (windows, iOS, android...)
- A tool for managing and control the groups by the teacher.
- Some tools for visualization, comment's notes and corrections during the working process (these tools should allow connecting with the common work environment).







## **2. Applications for building groupware environments**

At university environments where moodle virtual classrooms are used, it is possible using forum's groups where students can exchange information. The problem is that these forums do not allow working on the same files concurrently and collaboratively. While working on common files is important, you have to choose any of the existing environments for sharing files at the network. These kinds of applications were common in business, but there were difficulties implanting them and they were also too expensive. One of the first programs (year 2007), addressed to general public was goggle doc. This application lets everybody creating online documents; working on them in real time with other people, as well as storing documents and other files (all online and free). With an Internet connection, you can access your documents and files from any computer. After this program, the idea of cloud collaboration takes form and many other products start to appear easing teamwork addressed to non-professional public.

New cloud collaboration technologies have allowed users to upload, comment and collaborate on documents even changing the document itself. Evolving the document within the cloud can be called simply cloud computing, and during the last few years these applications are beginning to be increasingly used in education, allowing multiple users to work and interact easily. Moreover, there are free versions with enough storage capacity for educational needs.

However, besides thinking about the free access to evaluate the potential of these services, it is important considering whether of they can work on the main existing platforms or not. This is quite important, because students own lots of different devices that connect to the internet, but not all of them are based on Windows OS. Linux, MacOS and the mobile operative systems (Android and iOS) have an important presence in education centres. In the Table 1 below we may see a summary of the available applications and some of its more relevant features.

Table 1: Tools for cloud computing

TOOLS FOR CLOUD COMPUTING								
Resource	PLATFORM					STORAGE		General comment:
	Desktop			Digital Tablet		Minimum	Maximum	Remarks
	Windows	Mac Os	Linux	iOs	Android			
 Dropbox	Yes	Yes	Yes	Yes	Yes	2 Gb	18 Gb	It increases the storage capacity inviting friends to use it... Very implemented and connected with other applications
 SkyDrive	Yes	Yes	Yes	Yes	Yes	7 Gb	7 Gb	Allows creating and editing files online. It has applications (by operating system) that improve the performance of this service in the cloud.
 Google Drive	Yes	Yes	Yes	Yes	Yes	5 Gb	5 Gb	Advantages of Google services (Docs, Picasa, Gmail ...). There are many complementary applications. Inceasable 25 GB by paying a monthly fee.
 4Sync	Yes	Yes	Yes	Yes	Yes	15 Gb	15 Gb	15 free Gb and different payment options up to 100Gb.
 Sugarsync	Yes	Yes	No	Yes	Yes	5 Gb	32 Gb	The one providing the highest free capacity by invitation.
 Box	No	No	No	Yes	Yes	5 Gb	5 Gb	Allows creating and editing files online.

Among these applications, Dropbox have been selected because it was known by most students and have a direct connection with many other apps for digital tablets.

### 3. Applications for managing teamwork.

An important part of the teacher's work while facing working groups is overseeing the work. The virtual classrooms (for example, moodle ones), provide the ability for creating groups and assigning tasks to them, but its performance is not quite flexible and the tools provided are not designed to work offline. As a result many teachers complement the virtual classroom with a paper notebook where information about each group work is compiled as well as the attendance of their members and other comments relating to the teamwork.

By using digital tablet as a teacher's working tool, the mobility is improved and groups can be supported in the physical classroom space. Therefore, it is important knowing which applications, designed for digital tablets, allow educational management of students' groups. Among the existing applications, several have been analyzed, including: TeacherKit, Teacher Tool, Teacher's Assistant, Teacher Aide Pro and Visual GradeBook. TeacherKit had been chosen because it's free and besides, it allows management of the student's monitoring both individually and as a group while connecting to the chosen space at the cloud or Dropbox.

#### **4. Applications for visualization, annotation and correction of student works.**

For coordinating the work of the groups using digital tablets, the use tools that are connected to the same common space is necessary as well as correction and annotation of all work performed by the different teams. Students are asked to deliver some work in pdf format. Therefore, we have to select an application for digital tablets that allows visualizing and annotating through this format. Its ability for connecting to Dropbox is also important. Among the applications that meet these requirements, we can find the following ones: Notability, Neu.Notes, Notes Plus and Note Taker HD. For work in progress, Notability has been the application of choice.

As for the use of digital tablets while managing the group's work, the access to all documentation available in native software formats, such as Autodesk Inventor should be possible. This format cannot be open with the mobile operating system (Android & iOS). For solving this problem, the digital tablet is used for accessing a computer running such software (which may be either at the teacher's office or at the classroom) using a remote access application. This way, the teacher may be able to access all contents of group's work from his digital tablet whichever the format they are on. This availability is a proven fact since any program installed on your computer may be run when the application is remotely accessed. There are several applications allowing remote access, including: LogMeIn, TeamViewer, Jump Desktop and RDP remote desktop. For this experience, the LogMeIn application has been chosen.

#### **5. Description of the performed experiment.**

As we already mentioned before, during the first year Engineering Graphics degrees at La Laguna University includes subjects in its teaching methodology involving a working group of graphical simulation focused on engineering projects. During the 2011/2012 academic year, at the Computer Engineering and Agricultural Engineering degrees an experience was carried out through iPads and the tools described in this paper. As a result of that work, the students generated large amounts of digital information in multiple formats (pdf, video, Autodesk Inventor, jpg ...)

The subject of Engineering Graphics is included in a virtual moodle classroom that has different tools for collaborative work. These tools are not suitable for an important part of the proposed work, such as working simultaneously on assembly of pieces created by various group members. It is very interesting for teamwork that meanwhile a piece may be edited and modified by some students, others may be creating an animation of the assembly and others could be creating their engineering drawings. All operation is planned by the group's coordinator and monitored by the teacher, making a simulation of concurrent engineering processes. All this concurrent work has been possible through the use of Dropbox.

In addition, for accessing the common area there are all kinds of possibilities. So, accessing the information through the network or from a computer (even in local mode) or Dropbox app is available for both iOS mobile devices (iPad, iPhone, iPod Touch) and Android devices (digital tablets and smartphones).

For partial monitoring of the teamwork's evolution, students were instructed to generate information in pdf format (drawings and notes). The corrections could be made in a continuous way from the digital tablet using the Notability application and aiming to perform all kinds of annotations quickly. The fluency in correction processes was highly appreciated by the students.

The possibilities for coordinating and supervising the work of groups with digital tablets are really important because these devices can view and edit all kinds of standard formats (pdf, dwg, dxf, word, excel, PowerPoint, etc.). However, in the course of Engineering Graphics, software such as Autodesk Inventor is used and right now digital

tablets cannot work with native files from such programs. It would be interesting supervising the teamwork at early stages of the design, before generating final information in more standardized formats such as pdf or dwf drawings, installation or assembly videos in AVI or Windows Media, etc.

For correct this problem and maximizing the chances of digital tablets' mobility and autonomy, during the experience a remote access application, LogMeIn, was used for allowing computer access. In this computer there were all the needed programs for developing the subject's work. For example, using this remote access, it was possible running Autodesk Inventor, entering the common area of a group using Dropbox and modifying in real time the assembly that was being made by the students.

## 6. Conclusions

The implementation of this methodology and its tools has been easy for both, teachers and learners. The management of student's works has been better than in previous courses. This system has allowed greater interaction between group members and the teacher. Because of this, the work's quality is higher than previous years. We can globally rate this experience as very satisfying. Therefore, for the 2012/2013 academic year, this methodology is being adopted in related subjects.

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