



Could Smartphone in Science Teaching Foster Motivation and Positive Attitudes in Students?

Immacolata Ercolino¹, Sabina Maraffi², Francesco M. Sacerdoti³

^{1,2} UNICAM University of Camerino, Italy

³ Temple University, Philadelphia, USA

¹immacolata.ercolino@unicam.it, ²sabina.maraffi@unicam.it, ³francesco.sacerdoti@temple.edu

Abstract

Motivating students is one of the most challenging things we do as educators even though sometimes generates teacher's burn out.

One of the newer way to involve students in their Science learning consists in focusing on their usage and on applying knowledge and skills in their real-life. Students usually are engaged in authentic teaching pathway and highly value it as fundamental characteristic; good practice as hands on activities can be implemented in the classroom following the CLIL methodology focusing attention on experiencing real-life situations, this creates a positive classroom environment. New media equipment, as student's own smartphones, can increase the teaching impact speaking the same language the students uses every day. The touch interface on smartphones is tailor-made for curious students and they are learning how to better use the important technology they hold. Playing with their phone is teaching them about the technology.

The smartphone will play a huge role in that. These new tools improve life and quickly, all students (and teachers) have these powerful high-tech laboratory equipment in their pockets. A smartphone with thousands of apps provided by two high-resolution cameras can replace a microscope. The use of smartphones and all these sensors are becoming absolutely necessary in science teaching. They can measure magnetic fields, their GPS coordinates (longitude and latitude), and so on. In this way we can measure distances as parallax using mobile devices and simulate distance measurements in the classroom, on the school campus or measure the concentration of a reagent in a solution.

An example on a actual smartphone use for teaching is new class role-playing games which creates an adventure for the students which participate to the game with their own equipment.

The smartphone is the device with which the students answer questions, take decisions, solve quests.

This paper is focused on the effect of smartphone use in AstroQuest project which consists of a class interactive role-playing game to teach Astronomy, Physics, Chemistry.

The AstroQuest Project enhances interdisciplinarity between sciences and humanities and is multi-language in order to be used as CLIL compliance.

1. Introduction

Technology in education is in constant, progressive and rapid changing .This on the one hand creates challenges but also opportunities for teachers and educator researchers but on the other hand teachers and educators are facing with three different problems :

- Necessity of knowledge upgrading for the use of new devices and apps.
- a new communication way that changes the language teaching in a changing world. For example it seems that English language seem to be without limits to its growth in near future
- the challenges posed by the changes are such that communication media requires the development of different linguistic techniques and a growing utilization of Content learning Integrated Language (CLIL) methodology.

Mobile technology is reshaping science teaching: smartphones and tablets have realized or performed a deep change in the way people access, use, and share information. Sophisticated mobile devices and powerful digital applications enable users to access in different fields from the health care to the financial transactions.

Recently many educators researchers and teachers recognize the importance and the positive effects that technology shows on students in classroom such tablets and smartphones and applications improve the student's level of outstanding performance. This have helped in reducing social disparity, foster innovation and help students, teachers, and parents gaining access to digital content and carry out many activities with a very low cost if compared with the same amount of money you would pay for thousands books on scaffoldings. You can access to a huge amount of virtual books entering in a digital database that permits student to gain millions of sources. We experienced in the classroom that Smartphone can



really enhance motivation and positive attitudes: in fact: “*Students generally can forget their textbook but never forget their smartphone*” (Wulfran Fortin Physic’s teacher)

The smartphone has become an integral part of each of us. Everyone has a smartphone in hand and pupils of all levels, make no exception. They can communicate with the entire world for free but in Europe many are the schools in which is forbidden to use them also for teaching. It is important for teachers that want engage their students in use Smartphone in class to ask for headmaster authorization .

Are there now available any guides for teachers to use apps in their Science teaching in classroom?

We have here some very good examples that could be interesting spread to a wide number of teacher (from the pre-service teachers to the pre-retired ones).

2 .iStage 2- Smartphones in Science teaching

The idea of the publication maybe began in the international festival In April 2013 in Slubice Poland.

Science on Stage of Science Teachers meeting, after that, 20 european teachers were selected they came from 14 European countries and all together developed with 3 coordinators and the fantastic staff of Science of Stage Germany , sponsored by SAP after 3 intensive international workshops - Wien October 2013, Berlin april 2014, and the work continued by mail supported by a moodle platform - and the final workshop in Berlin December 2014 after 18 months. This succeeded in developing a scientific unique and very useful publication for science teachers that want to use smartphone in classroom. It was a unique simple work like a cooking book performing experiments step by step by Science teacher for teachers with the aim of fostering the enthusiasm of students working hands on in classroom. iStage 2 is a sort of a handbook on how to use apps (each unit comes with a complete list of apps for android and iOS) and smartphone in science teaching and Science on Stage is the European Platform fo Science Teachers

There are three big topics:

2 .1Eyes vision

Focus on the smartphone camera and sensors Smart Astronomers, Smart Measurements, How deep is your Blue.

2.2.Ears sounds

Focus on smartphone microphone. Spectral Sounds, Noise Pollution, Going for a Song, Fast and Curious.

2.3 Hands touch

Focus on smartphone ‘s app like gyroscopes camera and other sensors

Measuring the World around us, A smart accelerometer, Spot the Physics, The Earth Magnetic Field.

Briefly some example:

“Smart Astronomers From the Classroom to the Sky” (Eyes)

Science teachers know how difficult is to explain parallax measurements studying only from textbook. It is hard to explain because distances in space seem unreal to our students . Every teacher know how is difficult for students to understand the parallax because it is an abstract idea; but if we use smartphone and start an outdoor hands on activity measuring distances using mobile devices simulating distance measurements in the school campus we’ll succeed in fostering students’ curiosity and engage their enthusiasm in studying these topics.

“How deep is your blue – Coloured Chemistry with Smartphones” (Eyes)

Students can use a smartphone to measure the amount of copper that is dissolved in an aqueous solution of nitric acid

This is possibly using a colorimetric method and an app named “color crab” . The proceeding is clearly explained using another app, a QR Codes reader. That methodology can stimulate student’s scientific-inquiry learning and social interactions.

QR Code Quick response codes are bi-dimensional bar codes containing alphanumeric text and URL that redirect students to other sites where they can understand more about a particular topic.

We can also use the Smartphone as a Microscope with a particular lens (<http://www.microphonelens.com>)

3. AstroQuest Game

AstroQuest is a class adventure game based on Astronomy, Mythology, History, Physics and Chemistry.

The adventure is based on a special computer game to be done by the class as a whole.



The architecture of the system is based on a computer system which creates a LAN network on the classroom, a projector or a IWB to display

AstroQuest shows an ambient in which all the students moves with changing background images on the interface.

To enhance “educational” part in respect of a simple “emotional” part, the background is based on static images to leave the students to better “imaging” in respect of simple “viewing”.

The “emotional” part is automatic living the adventure experience.

The adventure starts from the Earth in a special “Shuttle” travelling to the sky.

The students moves on the planets, through the galaxies, finishing back on Earth or, in the bad situation, in a black hole.

The travelling is controlled via smartphone by the students, answering to :

- yes or no questions
- multiple choice questions
- choosing a path
- linking an image to another
- choosing from some images the ones with specific characteristics

The students answers any questions via a simple browser on their smartphone, giving the possibility to active participate to all also with simple smartphones.

The computer system changes the web contents of that specific page to adapt to the specific moment of the game.

The game is enriched by a talking voice (settled on different languages), musics, audio effects, videos, etc.

4. Smartphone interaction

The game to be a “class game” must enhance the cooperative learning through a group working.

The smartphone must be used by the students only when necessary, and not as they normally use time by time as in Facebook or chatting.

They must be concentrated together with their classmates on the IWB and not on the small smartphone screen or their own tablet.

On this exception, why the use of a smartphone indeed ?

Because the smartphone has this advantages:

- 1) the use of smartphone is a “natural” way to link himself with the outside: this enhance the student engage.
- 2) every students answers by himself avoiding information loose and crowd situation;
- 3) the computer system, receiving the different answers by each single students, can store them, doing statistics, evaluating, etc.
- 4) the computer system can record the student progresses

5. Conclusion

We have a complete powerful helper in our pocket. Smartphone can replace: telephone, camera, agenda, navigator, voice recorder, calculator, compass, ipod, microscope and even a telescope.

“Smarthonification” is acting nowadays on worldwide people and mobile awesome tool is changing our new generations life. Pre-teens and teens of today will grow as the first generation of very connect people as no generation to come before. This connection could be social (see movie “La corrispondenza” by G. Tornatore), and educational. Could be school interested in acting on this process to engage student in Science teaching with the smartphone ? Could mobiles improve science teaching in future? As science teachers we could have to take the challenge and using smartphones in the hands on activities in classroom to measure the added value of using the smartphone in science teaching comparing with the traditional teaching. The aim is to build up a teacher community interested in how enhancing fun and motivation in students with hands on activities using smartphone in teaching.

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