Exploring the Possibilities to Integrate AR in Blogs

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***Abstract*—**Augmented Reality (AR) may enable the use of technology in education in a way that has never been possible before. There is evidence from literature that AR has a positive effect on students learning combined with similar positive effects of using blogs. Two proposed approaches are introduced to harness the power of AR and Blogs in an educational setting: the first is using AR, triggered by markers, to solve a problem and upload the solution in a blog (where the blog is used as an electronic portfolio or E-Portfolio) and the second approach is Engine Based Blog. Both may utilize the power of AR to enhance learning, increase motivation, and provide students with 21st century skills. The first approach is simpler to implement. In this paper there is presented the case of an electronics course that uses AR circuits to solve electronics problems without involving any hardware elements. The second approach is a complex one. There are presented the principles of designing an AR engine for blogs based on an example from an anatomy course.

***Keywords*—** Augmented Reality, E-Portfolio, Systematic review, Educational technology

I. Introduction

AN important reason why AR technology will be very much used is that the necessary equipment is no longer sophisticated and expensive, such as Head-mounted Displays (HMDs) [1]. At present, AR technology is no longer cumbersome, it can be accessed via computer or mobile devices, making it accessible to any educational level, from pre-school to university. Everything that relies on working with the computer, and for the AR-VR class, is vital to meeting the specific hardware and software requirements. So, for the hardware part, the learners will need HMDs or Smartglasses, and on the software side, the graphic elements presented as an integral part will have to be done at high resolution and in as many details. The appropriate AR-VR interface will facilitate both the presentation of the graphic elements and the communication between the professor and the students. An AR-VR class has two environments where the courses, the augmented reality environment, and the virtual reality environment can take place. Those who are really present in the classroom will be doing their work in the AR environment. Graphics will be accessed through Smartglass, Smartphone, or HMD. The student and the professor will be able to represent their real image, the use of the avatar being optional. In the VR environment, however, students and / or the professor may or may not be present in the classroom. In this case, the use of the avatar is default, and access is via VR HMDs, such as Oculus Rift, Sony VR, HTC Vive, and more.

Blogs have become popular at some point as a need to have your own speaker corner from which to share your opinions as an alternative to the real world. The real world, perceived as a hostile environment, has led to a next step in using blogs that contain elements of virtual reality. These we called blogs based on augmented reality. These do not lose contact with the real world, just add virtual elements that improve reality.

Thus, are captured the interest and the attention of the students, connected today to everything that means new technologies and to the temptation to escape into a world built by themselves. Teaching / learning methods need to be adapted so that there is accessibility to information and also effectiveness of the teaching / learning act both from the perspective of the teaching staff willing to innovate, but also of the student able to assimilate knowledge.

We have proposed a research methodology going from simple application to complex one, for different study subjects, but the implementation of both students and teacher requirements must lead to the ultimate goal: better knowledge.

II. Literature Review

A. Blogs

The rapid development of the new technology has changed the classroom teaching methods and tools in a positive way [1]. From the new technology is a Blog which is ae web log based on Information and Communications Technologies (ICT) with specifically using Web 2.0 Technologies. Web 2.0 applications including blogs, wikis, social networking, social bookmarking, RSS, podcasting, media sharing etc., have enabled students to master many parts of the digital literacy requirements. Many academics, researchers, educators and shareholders have clearly stated that the emerged Web 2.0 applications have the potential to offer enhanced learning opportunities for both students and educators and support lifelong competence development [2]. Blogs is one type of

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digital composing where research demonstrates that digital composing promotes, for instance, iterative writing and gives opportunities for multi model expression, scaffolding and feedback, students do not necessarily engage in such advanced, participatory and reflective composing and revising activities [3]. Blogs have been defined (or weblogs) as "personal webpages, or home pages" which have typically four features: "individual ownership, hyperlinked post structure, updates displayed in reverse chronological order, and archival of postings" [4]. Most blogs are interactive, allowing visitors to leave comments and even message each other via widgets on the blogs and it is this interactivity that distinguishes them from other static websites. Blogs then are used to gather information related to a particular topic; as personal journals to record information on life events or any other event; as course management tools; as assessment tools and as communication and interaction tools. Blogs can also be seen as internet-based diaries that facilitate interactive computer-mediated communication through text, picture, audio and video [5]. A Blog is also a publishing tool which gives the user the power to show others on the internet and immediately his thought and his ideas manifested in a living multimedia format mostly with chronological order, so blogs as electronic diaries are publications composed for at least some audience [6]. In a blog created for educational purposes (also called an Edu blog), students or educators can use blogs for different purposes, e.g., as learning journal or knowledge log, or for recording personal everyday life, for expression emotions/feelings, for communication with others, or as assessment or task management tool [4]. Blogs can be used as supplementary mediums to promote achievement and knowledge acquisition of students as well as information searching and sharing skills within a learning community [7]. These results are supported by the research conducted by Hume where he found a rudimentary number of papers canvassing the role of online blogging in advancing student learning [8].

A Blog can do more than sharing information; it can be used as an electronic portfolio for the owner of the blog. Using a blog as an electronic portfolio (e-portfolio) had positively influenced some areas such as encouraging students using a PC, reaching the information on virtual environments, assessing themselves and monitoring their progress in developing computer skills [9]. E-portfolios provide a creative way of organizing, summarizing, and sharing to the world student artifacts, and demonstrating evidence of students' professional growth [10]. Evaluators can use these web portfolios to gauge student performance while the portfolios themselves permit rapid and immediate inclusion and editing of portfolio data by the student. E-portfolios are also useful for accreditation and evaluation purposes in order to measure and assess student learning outcomes. E-portfolio added value in students deep learning and keep them engaged, it also acted as a medium to involve parents, promoted students' self-esteem, and it was acknowledged as a valuable assessment tool for the school community [11]. Rubrics can also be incorporated into today's digital portfolios to permit fair and consistent evaluation by assessors. Numerous e-portfolio vendors currently exist and choosing the best one involves careful planning and consideration of current and future intended uses [12]. Portfolios used in K-12 classrooms give students the opportunity to collect, showcase, and reflect upon the work they have completed throughout a class or program. With the advent of the digital age, e-portfolios have allowed for this process to be conducted online through the use of Web 2.0 tools, offering a number of advantages and features that were not possible before [13]. Blaustein & Lou stated that the systematic literature review synthesized empirical quantitative and qualitative studies published in 2004-2013 that examined the impact of e-portfolios on student academic motivation, self-regulation, and performance. Findings suggest: 1) Both the process and product portfolios were associated with motivation and self-regulation. 2) Numerous studies have demonstrated the benefits of e-portfolios for increasing learning strategies, motivation strategies, academic achievement, and technical aptitude. 3) E-portfolios must be student-centered, offer some user control, and require full commitment and planning [14].

B. Augmented Reality (AR)

Lately, studies have been conducted to see how different types of Augmented Reality are used [15]. So, even with the smallest degree of immersion, the most used are mobile devices (smartphones, followed by tablets). Mobile devices, to the detriment of desktop computers, are ideal for AR applications, especially for lower levels of education because they are accessible, portable, independent [17], can increase social interactivity by encouraging educational activity outside the classroom [18]. For a higher immersion level, Head-mounted Display (HMD), Smartglass or Hybrid, such as Hololens or Meta 2, can be used. If HMDs become available to the general public by lowering prices and increasing performance hardware and software, Smartglasses are still far from being available on the market.

It has been noticed that AR technology increases student performance by improving practical skills during laboratory activities [19]. Student-material interaction recommends AR technology as a "learning by doing" method [7]. But this motivates them for a short period, due to the novelty effect they bring [20], but if it does not alternate with the classical methods in the curriculum, pupils' attitudes and motivations will diminish while they become familiar with Augmented Reality [21]. The materials provided (text, images, video) must be relevant and well organized to determine students to look for supplementary information related to curricular content. Enriching them with 3D graphics with interactive animations (elements of Augmented Reality) will make lessons easier to understand than through classical teaching methods [8]. The interface must be intuitive and allow immersion through as many senses as possible (visual, auditory, tactile) [23].

In the study [24] it is shown that educational systems based

on Augmented Reality technology can reduce cognitive overloading of students if these lessons are in the form of games in which collaborative learning is implemented and allow students to make their own decisions [ ], while also increasing pupil-student or student-student interaction. In the Augmented Reality, virtual graphic elements are projected over objects of the real world, so students can perceive their spatiality or view abstract concepts or unobservable phenomena with the naked eye (electron movements or Earth magnetic field simulation) [16], and by moving "Among" virtual elements, physical activity improves, improving motor skills [24].

However, in order not to require much time to create content and to make quick use of AR technology, it is advisable to create the teaching materials in small, not very complex quantities, endowing with quality equipment / devices (not to give errors during the course), and student participation in these activities in small groups [25].

Heather Bellini of Goldman Sachs Research predicts that augmented reality will become an $80 billion market by 2025—the size of the desktop PC market today [26]. According to Cakal & Eymirli [27] Augmented reality technology consists of four different environmental tools, a computer, camera, digital marker and real world. Augmented reality adds graphics, sounds, haptic feedback and smell to the natural world as it exists. Both video games and cell phones are driving the development of augmented reality [28]. AR increases learning and deepens impressions: The brain absorbs things 33% more effectively when exposed to the immersive atmosphere of AR and VR, according to Stanford University Virtual Human Interaction Lab researcher Jeremy Bailenson. Moreover, people exposed to the “embodied cognition” of AR and VR are 20% more likely to change behavior by experiencing the impact of their decisions [26].

III. AR BASED BLOGS APPROACHES

We present two simple-to-complex approaches to integrating AR into blogs.

A. e-Portofolio with AR

In a simple approach, the use of AR in blogs would mean using markers proposed by the teacher for students in the class's blog, so students are accessing the problem to solve with the mobile phone in AR. In the AR environment they have access to all the tools needed to solve the problem, and when they have found the solution, by making a snapshot of the phone screen they can upload the solution in their personal blog (Fig.1).

The proposed methodology is based on Ninth Grade Students Learning basic electronics and using their individual blogs specifically as an e-portfolio with AR. The application of AR proposed is AR circuits mobile app (http://arcircuits.com/) which is available in Google Play and App Store whereas the blog application proposed is Google blog which is available for free from (http://blogger.com). With the AR Circuits (fig.2) app students can practice building circuits without an electronics kit.

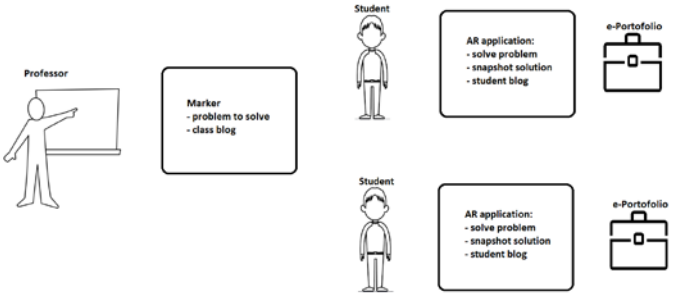

Fig.1. Simple blogs with AR

Components can be printed on regular printer and brought to life using a mobile device and augmented reality technology. The simple electronic circuits include circuits with power source, push button or toggle switch, lamps, and resistors in series, resistors in parallel and circuits in combination (resistors in series and in parallel). The Student then will take snapshots of the answers to the problems given and uploaded it to his/her blog which is used as an e-portfolio.

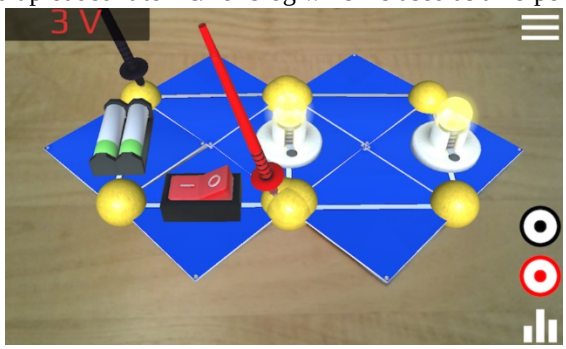

Fig.2. Example of AR Circuits

The advantage: Google blogger is available for free, there is no need for students to purchase kits or collect components, no need to get valuable hands-on practice with simple electric circuits. Students will be able to build and test realistic circuits without the expense, safety concerns, and inconveniences that come with physical electric components. Students will be given instructional worksheet to follow. They start by printing component cards (Available for free from AR Circuits website) then they will use their mobile phones to create AR environment according to the problem given in the worksheet, once they combined it with AR they take snapshot and uploaded it to their blog which is their e-portfolio.

The immersed learning combined with the advantage of saving snapshots on their blogs will boost their self-reflection, enhanced learning, and optimum motivation.

B. AR Engine Based Blog

The second approach is a complex approach, which involves the design of the whole AR content integrated into the blogs from scratch, just like a VR application.

The advantage of AR to VR is that, for AR, the environment already exists, it no longer needs to be created, but only improved with various elements, virtual "objects". Virtual objects are of three types: fundamental, interactive and

contextual. The fundamental elements (fig.3) are those that create the basic structure of the lesson and are at the first level in the course inventory. Interactive elements are parts of the fundamental elements, more detailed, which in turn can become fundamental elements to be the subject of other lessons.

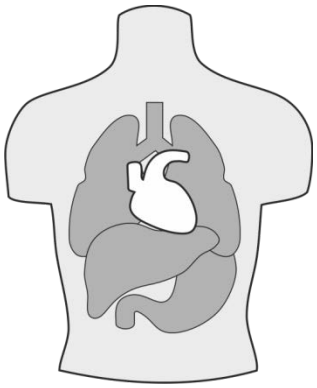

Fig.3. Fundamental element

Contextual elements (fig.4) will provide the necessary additional explanations in visual form in the description of the fundamental or interactive elements. These can be in the form of text, audio, video, images (static or 360°).

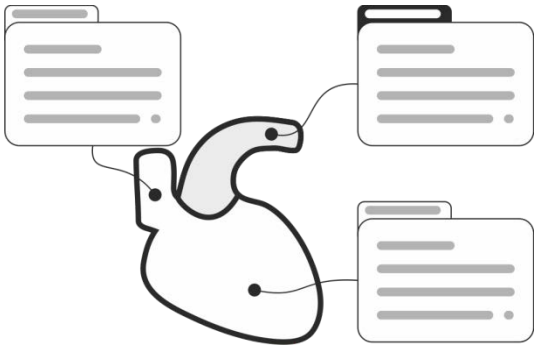

Fig.4. Interactive and contextual elements

In order to get these types of files, one can use 3D geometry software, or audio-video editing, or by purchasing products created by digital artists and delivered through online stores. The latter are indeed high-quality arts, but for the most part they are not free, but teachers have free online platforms (for 3D graphics: TinkerCAD, audio: Audacity, audio-video: Avidemux and others). Audio-video elements play an important role in creating realism in the virtual environment, but it can vary between abstract or realistic representations using digital or real-world recordings.

After creating a virtual 3D object, it can be animated if needed (a simple or interactive animation). Within CAD platforms, simple animations of 3D objects can be made, but they can be transformed into interactive animations if files are inserted into "joints", "motors" and are written a few lines of code. In Autodesk Tinkercad Circuit one can apply "electrical circuits" and scripts to 3D objects made in Autodesk Tinkercad. For example, a simple animation of a heart will present the natural movement of that heart, but in the case of an interactive animation, the different heartbeat rhythms may be displayed depending on the selection of various heart conditions.

Photogrammetry can include 3D models of real-world objects in the AR. Once a series of photographic snapshots are taken to the desired object, they will be digitized initially in the Agisoft Photoscan application, for example, and then the result can be refined in any desired CAD application.

In order to be able to access these files, they will need to be uploaded in specialized applications in the AR display. In AR technology, virtual objects are recognized in two ways: by means of link images (markers) or through the interpretation of the environment. The link images can be of two kinds: QRC code and representation of the object. By means of the second path in the environment, horizontal and vertical planar surfaces are interpreted, and these elements will "settle" according to their properties (painting on the wall, table on the floor). Once the link between the marker and the object is established, the AR application will upload the virtual element to the server (in the cloud) for later access. (Fig.5)

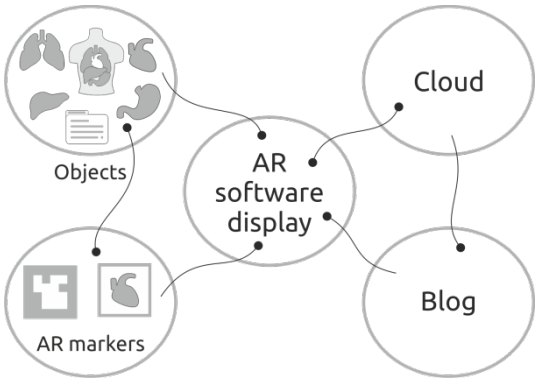

Fig. 5. Diagram of Object-AR software-Blog

To access virtual cloud objects in the cloud, the background image marker will be posted on the blog. In their construction the fundamental elements will have buttons, which may be parts of the general picture. In Fig.2 each internal organ is a button for triggering an animation or a contextual element.

IV. Conclusion

Even though the AR is a new technology that has not been fully revealed, yet the power that it has within can produce a promising effect to enhance learning, increase motivation, and provide learners with 21st century skills. The use of blogs as e-portfolio to record AR posts will enhance their understanding, promote deep learning. It will enable students to self-reflect on their posts and promote for them self-regulated learning. Engine Based blog is a different approach that has promising positive effects on students learning and motivation. The courses supported by AR can be carried out in the micro learning system and the virtual elements presented can be used in the laboratory, in the practical part of the course, in a relatively short time, in modules (some

informative) aimed at a specific objective or problem.

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