Smartphones at Schools? Yes, Why not?

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Abstract—During ages, new and innovative learning technologies are often criticized or rejected, while their full acceptance is commonly delayed. As a result, the progress of Smart Learning Environments is noticed nowadays to be delayed, while educator debate about the technology used in classroom effectiveness. Author’s objective is to explore potential factors in order to render modern communication devices such as mobile phones and tablets suitable for learning in schools, taking into consideration possible advantages or disadvantages. In the case that students use mobile devices during learning procedure, a shortage of suitable content as well as adequate integration of educational and edutainment systems employing gamification techniques within the school framework. These factors are considered to be sufficient enough to strengthen and improve learning experience and effectiveness.

Index Terms—Advantages of Mobile Devices, Disadvantages of Mobile Devices, Educational-Edutainment Systems, Smartphones at Schools, Smart Learning Environments.

I. INTRODUCTION

The perception of brain functions is related to learning procedure improvement that could be helpful in a better curricula design [21]. The brain has an extraordinary capacity to adapt, to modify its structure and function, and rebuilt itself in response to environmental stimuli, cognitive demands and learning experiences [13], [26]. Nowadays, children are born and grown up with a period with extraordinary digital technological achievements that touch the boundaries of science fiction of previous years and are familiar with the language of computers, video games, and the internet as a native language/mother tongue [40]. Their skills, attitudes, aspirations, and learning styles reflect the environment in which they are raised [34]. Children of this generation, often called “digital natives”, “the Internet generation”, “Net generation”, “N-Geners” or “N-Gen” [3],[11],[39], desire fast-paced interaction and graphics-based environments, they are active in their entertainment processes, they use their imagination, they seek for highly-demanding video games and playful environments, they try and explore digital innovations, and they are clearly able to use new “smart” devices. They are already immersed in technology, cultivate specialized technical skills, and develop hypertext minds. Their cognitive structures are parallel, not sequential, and reveal learning preferences for which traditional education is unprepared, and obviously seems boring [36], [4], [40]. Focusing on the students of Net generation, a question is emerging: “Do they really think differently?” [36]. Keeping these in mind, the challenge is to promote learning, creativity, and collaboration through content based on real-world scenarios, using children’s everyday tools, such as mobile devices.

II. TOWARDS A 21ST CENTURY PEDAGOGY

Not so far away, in 2007, the U.S. Department of Education (ED) reported that the results of extensive research on the impact of software on the achievements of students at all grades of education are not so encouraging [42]. The report concluded that there were no statistically significant differences between students who used computers in the classroom with content from their lessons (reading and mathematics) and students who followed the traditional method (teacher/pencil-and-paper/print-based training). This report has led to, even the public opinion, that introducing computers to schools is a waste of time and money.

Michael Merzenich [30] noticed that ED conclusion are not surprising and stated that “this study provides an alternative way to pile the same old content into a child’s brain”, and he continued saying that “adding the computer without changing the strategy adds... nothing”. It is clear that computers could be used in classrooms under the same conventional teaching strategies. According to Mary Ann Wolf stated, integrating technology for instruction is “much more than putting a piece of software into a classroom” [42]. Nevertheless, while introducing innovative methods in schools, intentness is needed, both for its impact on learning outcomes and on childhood development and behavior in general.

The 21st century is provocative. Schools adapting to a new pedagogy are about to suggest new learning environments that combine content with innovative technologies. Nowadays, skills like reading, writing, and arithmetic- known traditionally as “the three R’s” [19] are not efficient. Vital students skills are the ability to learn, communicate, collaborate, participate, explore and create, often referred “the four Cs”: (a) critical thinking; (b) communication; (c) collaboration; and (d) creativity [33]. New pedagogical models centered on building supportive, creative learning relationships use technology and digital resources as tools that enable and accelerate the new learning goals [15]. It is worth mentioning that technology integration in the 21st-century classroom that focuses on the connection between knowledge about content, pedagogy,
and technology is called Technological Pedagogical and Content Knowledge (TPACK). This model is based on Shulman’s [51] research who introduced the idea of pedagogical content knowledge by teachers while noticing that the content and pedagogy are not separated but a part of one indistinguishable body in the framework of teaching and learning. Moreover, Pierson’s [37] research lean towards the relationship between teaching abilities and technology-use abilities. Specifically, TPACK refers to the dynamic association of the three categories of knowledge: a) content, b) pedagogy, and c) technology [31]. The necessity of this model arose from Mishra’s, and Koehler’s findings, suggesting the absence of a theoretical basis on which a new pedagogy could be created serving the integration of educational technology by teachers.

New learning environments, so-called “smart learning environments” (SLEs) [8], reflect in a new pedagogy in the digital era, and underline the significance of technological design and instruction to support, facilitate, enhance, and improve learning. SLEs are enriched with suitable digital content in the context of real-world problems, and are adaptable, effective, efficient, enjoyable, engage learners and trainers [50],[20] and are based on a model of three instructional strategies-guidelines known as e3 for designing learning environments: effective, efficient, and engaging [29]. There are three essential elements in a technology-facilitated smart education environment: teaching presence, technological presence, and learner presence [56]. Spector [49] emphasized that SLEs have the potential to empower educators, students, and instructional designers, and to personalize learning adapting to their needs and situations. Personalized learning inspires teachers to design ways of approaching students individually, focusing on the particular learner’s interests, goals, progress and problems [48], following the principles of differentiated instruction, which support students with learning difficulties or special educational needs (SEN), different mother language, cultural, religious and / or socio-economic background, thus laying the foundations for inclusive education [54]. In addition, Spector [49] noted a difference between “personal learning environment” that is constructed and controlled by the learner, and “personalized learning environment” that adapts automatically to the interests and needs of individual learners. Thus, SLEs are ideally suited for struggling learners, respecting their own pace without distracting their classmates into an inclusive classroom. The 4th e (empowerment) enhances self-esteem, metacognition, and self-regulation. Additionally, SLEs allow teachers, and students to connect real-world scenarios with school content, responding to the old question “Why do I need to know this?” [2].

Nowadays, most children own a mobile device and they use their mobile to retrieve information [38]. It is worth wondering how to take advantage of mobile phones benefits under a well-designed educational content.

III. MOBILE BASED LEARNING

In several students’ primary query “Why do I need to know this?” the answer is "Because it is useful for you", but in this case, students are not able to be self-motivated and engaged. The dominant instructional approach in education worldwide still prevails the “transmission” or “lecture” model [45] leading most of the learners to boredom. Given that many of the educational activities planned in schools are not designed to subdue students’ internal interest, a key question is how to motivate students to value, and engage in activities without external pressure or rewards, to feel the freedom of choice, self-regulation, and autonomy [43]. The common problem for all teachers is that the students cannot pay attention. Nowadays the problem is not that students cannot pay attention but that they choose not to pay attention [36]. However, in the context of “smart education”, the effort of teachers to gain the attention of their students is easier, as they show the relevance of learning content, using materials from their “world” such as digital, especially mobile, devices with which children are familiar, and enhance students' self-confidence, and satisfaction. “Smart education” comprises all of the features that are the basic principles of Keller's theory for motivation (ARCS-V), i.e. curiosity, relevance, confidence, satisfaction, self-regulation [24], [23].

Spector [48] pointed out that a learning environment is smart when it includes innovative features, and capabilities, as smart hardware, e.g., smartphones, laptop, and Google Glass [57] and software, which improve understanding, and performance, and promote engagement, effectiveness, and efficiency. But not every smart technology is smart learning technology [49]. “Smart education” is not a smart device education, but rather an educational paradigm adaptation for digital natives. Prensky [41] mentioned: “it is not the tools themselves that we need to focus on, but rather the creativity and skills that the tools enable and enhance”. In this framework, more focus should be given to learners and content than on devices alone [18]. Leadbeater [25] argued that a successful educational system depends on transforming pedagogy and redesigning learning tasks. Promoting learner’s autonomy and creativity is a part of the new pedagogy. Technologies can support this transformation of pedagogy and teachers can shift their roles from “content conveyors to content curators” [46]. The classroom equipment with tablets or smartphones conducts the learning literally to the hands of the students while the teacher is the facilitator and collaborator of the process [16]. Smart devices, such as smartphones, are small, portable, and affordable, support and engage learners anytime, and anywhere, and improve learning, often in gameful context [17],[57]. Mobile device portability affects teaching and learning by overcoming the use of personal computers. As Billinghurst [5] pointed out, using mobile devices, new opportunities are emerging for an extremely interesting interactive learning experience. Such experience strengthens cooperative learning as students can sit together and see each other, and personalized and self-directed learning, as well [14]. When students work together, the space between them is used for non-verbal communication, such as glances and gestures [6].

Although mobile devices have enormous teaching and learning potential due to their built-in cameras, audio recorders, navigation GPS and maps, etc, its use should be in a way that will not impair the sensual experience, and unmediated learning [52] and have to function as
supplementary and helpfully tools. For Tal and Gross [52] there are four requisite conditions for the successful integration of technology, pedagogy, and learning content: (1) the courses which delivered by mobile devices should take place over a sufficient period of time during which the students should gain the pedagogical basis of the experiential activity, and familiarize themselves with the potential of the devices in learning, (2) the location that the activity takes places should have strong and uninterrupted signal or Wi-Fi otherwise it will generate irritation and disruption, which will disturb the learning process, (3) the activity through the learning platform should be tested many times in order to be user-friendly and have the desired learning outcomes, and (4) the model of mobile devices chosen for experiential learning activities should support the software used for the application.

Mobile learning can alter the experience of the student, and depending on learner's profile, the multimedia can adjust the content, can provide human voice narration by a pedagogical agent, which according to Park [35] promote learners’ interest. This possibility is offered successfully through smartphones taking advantage of the opportunities which virtual and augmented reality technology gives. Smartphones can operate as an assistive device through the multimedia learning applications and assistive technology could be shifted from "rehabilitative" to learning tool, and also as a tool to access curriculum for all the students, with or without disabilities. Voice recognition, provision of audio or texting, visual and /or tactile feedback upon pressing the keypad, convert displayed electronic text into speech are some of the new smartphones' accessibility features for people with disabilities related to memory, analytical skills, attention, reading skills, mathematical or computational comprehension, reading comprehension, and communication [28]. This technology in a classroom has the potential to allow differentiated instruction and enrichment of the learning experience of students with SEN, allows the learning to be student-centered and creates opportunities for collaboration that fosters a deeper understanding of the content [1]. Mobile learning could bridge the gap between SEN and their typically developing peers, facilitating the inclusive education.

IV. SHOULD SCHOOLS ALLOW SMARTPHONE USE?

Using technologies and mobile devices like smartphones as educational tools respectively is also related to the attitudes, and perceptions of parents, teachers and students of mainstreaming and special education, attitudes that reflect the policy-makers. The findings indicate a multifactorial correlation between social norms and experience in digital educational environments due to theoretical frameworks of technology, teachers training in ICT, digital content implementation as support in the field of special education, users self-efficacy, and technology addiction fear [12],[27],[44],[55].

France is considering banning smartphones in schools because students are simply too distracted. On the other hand, in some parts of Canada, Australia, Denmark, Sweden, Spain, Romania and Estonia, students are encouraged to bring their own devices (BYOD system) to school for learning, while the acceptance of smartphones in class varies by local region. In the U.S.A, states and cities make their own decisions about device usage. And while in Italian schools, a ban on phones was lifted recently when the Education Minister referred to smartphones as an “extraordinary tool to facilitate learning” [10], in Greece, with recent legislation [58], the use of mobile phones and electronic devices by students and teachers in schools has been banned. Teachers, in addition to school-based electronic devices (PCs, laptops, tablets, interactive boards, etc.), can also use their own personal electronic equipment during the teaching process and for its needs as well as in within the framework of the educational process in general, in compliance with the security rules and relevant provisions on the protection of the personal data of students and teachers.

The debate between the advantages and the disadvantages of digital devices in the classroom is crucial. One could say that digital natives cannot be cut off from everyday devices, and at the opposite, there are the "digital immigrants", i.e. the generation of their parents and their teachers, who use enough, little or not at all the technology that their children use, since most of them are "unteachable" or they do not want or even afraid to touch digital devices, as they have been born and grown up in an environment that was clearly different from N-Geners. It should, however, be pointed out that in a few years, there will be no digital immigrants, at least in this form. If someone will not be involved with cutting-edge technology, it is likely that this will be only a matter of choice, and attitudes. It is also worth noting that digital natives have already entered the education system as educators, parents, and politicians, which will bring changes in the approach of the issue, as gradually replacing the "digital immigrants".

However, it should be pointed out that objections to the ban on mobiles in schools are not unfounded. These negative elements associated with mobile phones are mainly related to the opportunities they offer in communication, or better by misusing them as a communication medium rather than as an educational tool: textese (i.e. the abbreviated language and slang used when sending text messages while some educators believe that this destroys the language and children’s ability to write), cheating, cyberbullying, sexting [53], harmful effects of digital devices (USA Environmental Protection Agency concerns about long-term exposure to wireless devices and computer screens), inappropriate materials, distraction, social disconnect (i.e. beliefs that too much time with digital devices disconnects students from face-to-face social activities, family communications, and nature), social gap (i.e. some schools have the means to address the digital divide so that all of their students have access to technology and can improve their technological skills, meanwhile, other schools cannot afford) [9].

Despite the negative effects that mobile devices may have in schools, when the conditions and restrictions are not met, there are remarkable surveys on the usefulness of mobile devices in schools in the framework of instructional benefits as: texting, digital cameras and images (supporting the data collection, scientific visualization, communication, facilitation of reading, writing, and visual communication in language arts, mathematical analyses, transformations,
and providing a context for problem solving in mathematics, and as a tool for inquiry in social studies), capture dynamic audio and video recordings-podcasts (increasing motivation and higher-order thinking and improving student writing and listening skill) [53], instant answers, wider access to information, social learning, teacher advancement [9].

Montreux and colleagues [32] conducted a research about tablet devices and concluded that both teachers and students appreciate the added value of tablet devices, referring to the ease of use, the speed of accessing different learning materials, the ability to be able to instantly search additional information, the ability to take pictures and to integrate notes, and communication between teachers and students. An equally important finding was that younger pupils aged 11 to 14 said they were more positive about the use of tablets in schools, indicating that the lesson before the introduction of the tablets was dull. On the other hand older students aged 15-18 noted the problem of having less of an overview of the course content and the major issue of distraction.

After all, to allow mobile digital devices, there should be guidelines and rules. Students need to be taught safely online, make judgments about identifying sources of good quality information, thus cultivating critical thinking, and being restricted from personal use to the classroom. In other words, students and educators must develop digital literacy and policymakers should consider introducing technical and pedagogical support to facilitate both teachers’ and students’ understanding of the potential of mobile devices in education [32]. Policymakers should take into account the lack of adequate learning material, which is a serious obstacle for schools to successfully implement this technology. Therefore, researchers, designers, and educational material producers also have some responsibility for facilitating the success of these educational innovations. Without the proper equipment, training, and support, many teachers will continue to use mobile phones as a simple device, ignoring the many opportunities they offer in education.

V. Conclusion

Students are using technology to analyze the world, to access information, to interpret and organize their personal knowledge, and its representation to others [22]. New pedagogy purpose is not only to obtain knowledge but learning process enhancement. Smartphones are suggested to enhance experiences exchange and multimodality, are useful for sharing information instantly, as well as to reduce boundaries between formal and informal learning. New pedagogy models blended with ICT are involved with virtual, augmented and mixed reality, 360° videos, etc. In the case that educational technologies are used appropriately, multiple forms of learning are promoted, as well as collaboration, personalization, participation, productivity, creativity, and many more active skills. Mobile phones are considered suitable for learning process due to their small size, portability, affordability, availability, their potential to engage users anywhere and anytime, as well as their ability support fast-paced interaction multimedia applications, video games, and playful environments. Reinforcement of students' and educators' creativity by allowing them to design and produce their own content is highly significant. Therefore mobile devices are suggested as educational tools, offering opportunities for poor people, and patronizing inclusion because they promote personalized learning [49][47]. Author's future work leans towards providing evidence that the digital learning materials and mobile devices are able to enhance the learning process and promote collaboration with schools in relative educational issues.

REFERENCES


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