Some of the challenges and experiences of formal education in a Mobile-Centric Society (MCS)

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Abstract

The aim of the paper is to describe some of the challenges faced by schools, or by formal education in general, as a consequence of today's mobile-centric society (henceforth MCS), the term we will use to denote the new, networked learning ecology that has arisen from the massive penetration of digital media in everyday life. After revisiting some of the ideas of McLuhan and Vygotsky in the light of this new technological scenario, we describe five traits of the MCS and the challenges – illustrated through educational practices – that we believe schools will face if they wish to preserve their function of individualization and socialization. We believe that despite the emergence of the MCS, the main function of the school is still to provide the "box of tools" (a set of psychological instruments, such as reading, writing, mathematical notation, digital literacy, etc.) that enables people to develop their learning skills and life projects and to become part of communities and groups. However, the complexity and mobility of the new learning environments means that the position held by schools needs to be re-evaluated in the face of the informal learning paths and experiences – both online and offline – to which learners now have access. We also need to re-evaluate the meaning of the school itself as an institution and the model of learner it should be training.

Keywords

Mobile-centric society; Digital funds of identity; Digital literacy; Informational age; Connected learning

Algunos retos y experiencias de la educación formal en la Sociedad Móvil-Céntrica (SMC)

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Resumen

El objetivo del artículo es describir algunos retos a los que se enfrenta la educación escolar o formal ante lo que aquí llamamos Sociedad Móvil-Céntrica (SMC), definida como una nueva ecología red basada en la penetración masiva de los medios digitales en la vida cotidiana. Después de revisitar, a la luz del nuevo escenario tecnológico, algunas de las ideas de McLuhan y Vygotski, se describen cinco rasgos de la SMC, así como retos -ilustrados con prácticas educativas- que a nuestro parecer emergen en los escenarios escolares si quieren preservar sus funciones de individualización y socialización. Consideramos que en la SMC la principal función de la escuela sigue siendo la de transmitir la "caja de herramientas" (instrumentos psicológicos como la lectura, escritura, notación matemática, alfabetización digital) que permiten a las personas desarrollar sus capacidades de aprendizaje, proyectos de vida y formar parte de comunidades y colectivos. Sin embargo, la complejidad y movilidad de los nuevos entornos de aprendizaje obligan a replantear la posición que debe ocupar la escuela frente a las trayectorias y experiencias informales -online y offline- de los aprendices, así como el sentido mismo de la institución escolar y el modelo de aprendiz que debe fomentar.

Palabras clave

Sociedad Móvil-Céntrica; Fondos digitales de identidad; Alfabetización digital; Era Informacional; Aprendizaje conectado

I. Introducction

The school, as a formal institution of teaching and learning, is a social context that responds to a need to transmit the cultural legacy and heritage of a community to its members. This enables people to grow as individuals, in the sense that they have the "box of tools" needed to develop their life projects, to construct their own identity as persons and to socialize with others, through participation in various collectives and groups. However, like any social institution, the school is not an abstract body that operates outside the social, historical and economic context of which it forms a part. On the contrary; and any structural transformations in societies should be matched by structural transformations in schools.

In this sense, one of the great tests for schools facing the challenges of the 21st century is to position themselves and respond to the contemporary attitude of an era in society described as "liquid" (Bauman, 2000), "reflective" (Beck, Giddens & Lash, 1994), and "informational" (Castells, 1996). According to some authors, this involves the emergence of new learning ecologies (Barron, 2004) which require a profound rethinking of the school curriculum (Coll, 2013) and the relationships between what happens in and out of school (Erstad & Sefton-Green, 2013; Esteban-Guitart & Vila, 2013; Ito, Gutiérrez, Livingstone, Penuel et al., 2013; González, Moll & Amanti, 2005; Vila & Casares, 2009).

The aim of this paper is to describe the key features of what we refer to here as the Mobile-Centric Society[1] (MCS) in order to illustrate the impact it has on the reforms necessary to update the school as a social institution of teaching and learning. Such an institution must respond to a specific social and cultural context and project. A lack of understanding of the social, economic, psychological and cultural matrix of a community, nation or country, will therefore prevent schools from finding their place in society if what they want to continue their mission to train competent people – regardless of their origin – for today's society and for the future. Moreover, as some authors have recently stressed (Coll, 2009, Gee, 2013; Vila and Casares, 2009), if school practice and school aims fall behind or lose sight of the sociocultural context, the very meaning of school education may be lost. That is to say, the mission of formal education will be brought into question; its limitations open to considered criticism; it will be unable to respond to the challenges facing the community/society and there will be significantly reduced expectations of its usefulness. All of this will be made manifest via empirical markers such as discontented students, families and teachers, higher rates of early school leavers and drop outs, absenteeism, failure, indifference, boredom and lack of involvement.

This article focuses on three main areas. First, we intend to stress the psychological and social importance of the media – digital media, nowadays – with the help of McLuhan and Vygotsky. Secondly, we intend to highlight some of the features of contemporary societies in which digital media is becoming a core element. Third, we reflect on how the school, or formal education, can be re-situated within the mobile-centric society with a number of

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[1] Although we can find some entries on Google by "Mobile-Centric Society", that means it is not an original term, the term has not been conceptualized neither developed. It has been used generally. See http://www.capv.com/public/Content/INFOSTATS/Articles/2012/07.11.12.html or http://businesstech.co.za/news/it-services/14736/africa-the-mobile-centric-society/ for examples.

examples illustrating the educational practices which, in our view, correspond to the mission that schools must accept in the present day.

a. McLuhan's TV-centric society of and Vygotski's principle of meaning. Technology as cultural ecology

The first idea we want to emphasize is the psychological, social and cultural importance of the media. Such emphasis is necessary before any discussion on the media and justifies why we need to characterize the features of modern societies in terms of its digital technologies or media. In the words of Ratner (2006, p 13), "we are the product of the products we produce." That is, the media comprise particular psychological and social architectures. We actually build certain kinds of relationships, behaviour and ways of learning that are specific and contingent to the media. We think this idea is rooted, or at least can be sustained, in ideas stemming from authors such as McLuhan and Vygotsky. Obviously, other authors have explored these ideas but here, for reasons of space, we will focus only on these two. We will re-examine McLuhan's well-known expression "the medium is the message", and Vygotsky's explanation of the specificity of human behaviour.

Although fifty years have passed since Marshall McLuhan wrote Understanding Media. The Extensions of Man – one of his most widely-known and most often-quoted books – a number of his ideas are still valid today. One of these refers to the dual nature of technologies or the media. On the one hand, any instrument created during the historical and cultural development of humanity is an extension of human powers or abilities. The train, for example, is an extension of our legs and our ability to move; television extends our sight and perceptions; Facebook extends language and communication. On the other hand, the importance of the artefact – devices or media – is not its message but the medium itself; hence the phrase the medium is the message (McLuhan, 1964). One of McLuhan's examples is the light bulb. The light bulb has no content and no message. It does, however, create and make possible certain forms of behaviour and relationships. It enables people to read a book at night, for example. What is relevant from a psychological, social and cultural perspective is not what is said by phone, but that the phone, as a medium, creates what could be called a cultural ecology, i.e., involving certain social relationships, cultural practices and activities and psychological forms of life. Television, video games, computers and the internet, for example, change family routines and encourage the so-called visuospatial intelligence (iconic representation, spatial visualization) and multitasking skills (Greenfield, 2009). What matters is not the content that appears on TV, video games or the internet, but the culture –the cultural ecology – that the medium ends up creating: its psychological and social consequences. And these psychological and social consequences, for McLuhan, are the change of scale or rhythm or pattern that the medium introduces into human affairs and daily activities. That is, the railway did not introduce movement, but it did accelerate and expand the scale of previous human functions, creating brand new types of cities, work and leisure. This is totally independent of the cargo – i.e., the content – of the medium we call the railway. Hence, it is the medium that shapes and controls the scale and form of social and cultural interactions, such as new ways of working that internet has produced or, for example, changes in the routine of Congolese fishermen who have stopped simply taking fish to the market and now wait for calls from customers (Schmidt & Cohen, 2013).

However, the media in McLuhan's society has little to do with the media that surrounds us today. In fact, it could be said that the real intent of McLuhan's idea that the medium is the message was to warn us about the harmful and negative effects of television, which he dubbed the "shy giant". McLuhan's society was TV-centric, given that television – first broadcast publicly by the BBC in England in 1927 – became the medium that revolutionized people's daily lives and lifestyles.

As with McLuhan, Vygotsky also believed technologies are extensions of human faculties: writing is an extension of memory and thinking, for example. However, Vygotsky goes a little further by stating that what sets our species apart is an ability to regulate our behaviour, and that of others, through the creation and use of signs and symbols, psychological tools (Kozulin, 1998), artefacts (Cole, 1996) and prosthetic devices (Bruner, 1990), which enable us to amplify our psyche and overcome our biological limitations (as, for example, an airplane can overcome our limitations in terms of displacement). In this way, actual human behaviour is, in fact, culturally-mediated behaviour. And culture – specifically human culture– is the result of an historical accumulation of tools both symbolic (a mathematical equation or musical notation) and material (a mobile phone or a house) that can regulate the behaviour of people: a traffic light allows us to cross the street, a calculator allows us to do sums or an educational law can organise a school. According to Esteban-Guitart (2013), this involves intentional conditioning which explains the specificity of our relationship with the medium. In short, people are no longer constrained or conditioned biologically because their environment can be deliberately manipulated: by setting an alarm clock for 7:00 a.m. we counteract our "biological clock". Hence the human psyche and behaviour is to be found scattered among local contexts of activity. By using and manipulating cultural artefacts, we broaden our ranges of activity. What Vygotsky (1997) called the principle of meaning (creation and use of signs) according to which people introduce artificial, arbitrary and conventional stimuli (to a coin, for example) to give meaning to their behaviour and to allow their psychological acts to be governed from outside (making a decision, for example, by tossing a coin).

In short, technology – devices or media – is neither inherent nor ancillary to our behaviour; rather, it is a part of it, assisting, accompanying and manipulating our behaviour in certain ways. Hence, we can talk of TV-centric, PC- centric or mobile-centric societies. Ultimately, television, computers and mobile phones are media that regulate human behaviour, social relationships, routines and lifestyles, teaching and learning situations, and help to make up the psychological architecture of people.

b. From the PC-Centric (PCc) to the Mobile-Centric Society (MCS)

The impact of television as a medium and as a cultural ecology (in the TV-centric society) was soon added to by the appearance and use of personal computers (in the PC-centric society). But now digital mobile phones (smartphones) and other digital technologies, such as tablets, have become the mediating element of endless human actions and interactions integrating other devices, such as television and radio, into their uses and applications.

By emphasizing the transition from the TV and PC-centric society to a mobile-centric one, we are not saying that people no longer consume television and radio or personal computers. According to the *Asociación para la Investigación de Medios de Comunicación* (AIMC) in a

recent study from October 2012 to May 2013 in Spain 33.8% of the population were daily newspaper readers, 61.8 % listened to the radio each day, and 89.2 % watched television each day. At the same time, 50.7% had looked at the internet the previous day (AIMC, 2013). People continue to watch TV and use computers. However, two things have changed. First, there has been a convergence and integration of devices (TV, radio, press, internet access) into digital media (latest generation mobile phones, for example). Second, as the AIMC study shows, there is a trend of increasing internet use and a decrease in the consumption of newspapers, supplements, magazines or TV. For example, in 1997 the penetration of TV was 90.7% compared to 89.2 % in 2013, while during the same period, internet use increased from 0.9% in 1997 to 50.7% in 2013 (AIMC, 2013). This trend is expected to strengthen as new generations of young people move into higher age groups. This is because of the observed generation gap in internet use, in addition to the influence of variable socioeconomic level, which does not occur in the case of audiovisual media (for details see AIMC, 2013).

In Spain, for example, it is estimated that in 2012, some six million people lived permanently connected to the network, communicating daily with more people through social networks (about 23 people on average per day) than they did in person (about 16 people per day. In fact, mobile phones are considered to be the engine of the internet's growth since more than 40% of users are connected via these terminals (210% more than in 2011), as the number of mobile devices with internet access has grown by 68% compared to 2011, along with a surge in the number of mobile applications, or apps, 2.7 million of which were downloaded per day in 2012. In fact, Spain leads the European Union in smartphone sales, with 63.2% of mobile phone customers using them (Fundación Telefónica, 2013).

Worldwide, the trend is similar. The average rate of mobile phone subscription in 2012 reached the equivalent of 96% of the world population, when only four years before it stood at 68%. Mobile broadband subscriptions have grown by an average of 40% annually since 2007 and in 2012 stood at around 1,600 million worldwide. This means 60% of internet users are also users of mobile broadband internet, which surpasses the figure for landline broadband subscriptions. 38% of the world's population, and the percentage is rising, are internet users and it is estimated that there are more than 1,720 million social network users (Fundación Orange, 2013).

Therefore, with the term mobile-centric society, we want to emphasize the importance and the central role that the use of mobile digital devices has in our society, and the flow of information through the web which means that, to a greater degree than ever before in history, the offline world has penetrated the online world. As we said earlier, television (TV-centric society) and computers (PC-centric society) have not disappeared, but they have, as devices, been integrated into more commonly-used media, such as smartphones. In 2012, in Spain, 63.2% of all mobile phones were smartphones (Fundación Orange, 2013), a figure that will surely increase in the coming years.

The figures and data provided in the reports by the *Fundación Telefónica*, the *Fundación Orange* and the *Asociación para la Investigación de Medios de Comunicación* (AIMC) further illustrate the transition from the PC-centric society to the mobile-centric society. In brief: internet connections from mobile phones have risen 300%, while connections from the PCs have fallen by 5% in relation to 2011 (Fundación Telefónica, 2013). Furthermore, according to the *Fundación Orange* (2013), ownership of mobile phones in Spain (94.3% of the population) and is clearly superior to the ownership of personal computers (72.2%).

According to Eric Schmidt, CEO of Google, and Jared Cohen, director of Google Ideas Foundation, everyone will be online by 2020 via the "mobile web". In 2012, there were already more than 650 million mobile phone users in Africa and about 3,000 million in Asia (Schmidt & Cohen, 2013).

Such data allows us to assert that we have entered a new phase in the area of computers, characterized by mobility, ubiquity, portability and the integration of multiple devices, applications and functions. It is to be expected that this will accelerate in the coming years and that digital media will penetrate everyday artefacts and spaces such as mobile phones, glasses, watches, household appliances and, for example, museums. The challenge of the mobile-centric society seems to be to find ways to develop and implement devices based on new architectures of software and hardware integrated into everyday objects that can work simultaneously, that can incorporate different features and applications, and that can be integrated and can interface with offline, real world environments. All of which must be mediated by the active participation of users – no longer simply consumers – whose profiles, experiences and identities are distributed among the devices both creating and sharing what they do. A good example of this is the "Google Glass" project, augmented reality glasses that integrate different technologies and features such as voice recognition, the ability to take and share photos, obtain geospatial information or communicate with other people.

II Development

The massive penetration of digital media into everyday life that this mobile-centric society (MCS) has produced is a challenge to the educational and learning sciences. The educational sciences cannot stand watching from the sidelines as the devices people use undergo such changes. There have even been calls (Gee, 2010) for a new discipline to be called Digital Media and Learning (DMAL). However, before assessing the challenges and the new grammars of formal education in the light of the mobile-centric society, we need to specify – operationalize – the content of that society. The goal, then, is to briefly describe certain aspects that seem particularly relevant to the mobile-centric society, so that, subsequently, we can discuss some of the trends in formal education consistent with the opportunities and resources provided by the MCS.

a. Five characteristic features of the MCS

It is not our aim here is to provide a thorough analysis of what we call MCS, but rather to describe what we think are some of its most significant aspects based on five characteristic features, namely: 1) multimodality, 2) convergence, 3) creating & sharing 4) fluid communities of interest and finally, 5) distributed knowledge.

In a context of a written literacy in traditional school practices, the TV-centric society revolved around an iconic, oral and visual culture. The PC-centric society, in its initial phase of implementation and development, brought the two legacies together, offering a technology – electronic text – that was written and visual. This multimodality of electronic text, which integrated text, images, sound and videos expanded further in the MCS in which the medium is bidirectional and its use is primarily tactile. Perhaps the biggest innovation in

the digital culture is the importance and recognition of the senses, such as, for example, gesture in the Nintendo Wii®, and the incorporation and convergence, expected to increase, of online experiences (images, texts) and offline experiences (senses such as smell, touch and taste). To this informational multimodality (the integration of written text with images and new emerging forms of online-offline modalities) we need to add another, in relation to the device (or medium) itself. That is, in the MCS, there are countless digital media devices (video games, smartphones, laptops, tablets, etc.) that allow us to access, construct and negotiate meanings. And these devices tend to converge and integrate with one another, the paradigmatic example being the smartphone, which integrates different applications and enables us to perform various activities way beyond a simple phone call. With a smartphone, we can access the internet, read e-books and digital newspapers, watch television (and download movies and TV series), listen to music and radio, record and upload videos (YouTube), communicate and participate in social networks (WhatsApp, Twitter, Facebook, LinkedIn, Instagram, email, etc.), take and share photographs, shop, play and take part in an ever-increasing number of activities.

Hence, when we talk about convergence we do so in two senses. First, technological convergence involves the development of new products via a new combination of knowledge that comes from different fields. For example, the combination of nanotechnology with the information and communication technologies facilitated the development of the ubiquitous, wireless, barely visible devices which carry out the same functions as previously much more bulky objects. Compare, for instance, the wireless access to the internet provided by a latest-generation mobile phone to the rather more robust personal computer typical of the PC-centric society. Smartphones were developed precisely as a result of technological convergence. The second type of convergence, and one more relevant for our purposes, is cultural convergence (Jenkins, 2006). In this case it is a cultural change that affects the use of media, a use related to what the author calls participatory culture, and is linked to the third characteristic feature of the MCS – creating & sharing. According to Jenkins (2006), convergence means the "flow of content across multiple media platforms, the cooperation between multiple media industries, and the migratory behaviour of media audiences who would go almost anywhere in search of the kinds of entertainment experiences they wanted." (p. 14).

The so-called Web 2.0, and the digitization of media, brings with it a new relationship between the product (the medium) and the user. In the MCS, people no longer passively consume what the media offers, as occurred in the TV-centric society. People create and, automatically, disseminate (i.e., publish, share) what they bring to the medium and it becomes a public event. This is what Jenkins refers to as the participatory culture, which is characterized by affiliations (members who form part of online communities focused on various forms of exchange, such as Facebook, Instagram, MySpace, etc.); expressions (producing texts or images via YouTube or Instagram); collaborative problem solving (working online and in teams in order to complete tasks and develop new knowledge such as in Wikipedia or in certain online games) and, finally, circulation (sharing the flow and the results of using communications media, for example in blogs, as well as of everyday experiences to do with, for example, hotels, restaurants, gaming or cities).

The ideologues behind Google, however, warn of certain dangers relating to the new participatory culture that digital media is creating (Schmidt & Cohen, 2013). One of these dangers is what we might call the end of privacy. That is, all this data (pictures, likes, texts,

the web sites we visit, circles of friends, previous experiences) that accumulate in the "cloud" is stored, which means that it becomes public. Thus, as Eric Schmidt stated recently: "Since information wants to be free, don't write anything down you don't want read back to you in court or printed on the front page of a newspaper" (CNN Mexico, Saturday April 27, 2013).

Moreover, public does not simply mean that the experience – in the form of digital footprints – is stored and shared, but that the process of creation and the negotiation of meaning is carried out on the internet. In this sense, it was Castells (1996) who was one of the first to theorize about the meaning and scope of what he called the Network Society as the dominant form of social organization in the Information or "informational" Age (defined as the use of a new technological system based on microelectronic technologies and communication based on digital networks). Of course relationships and social networks have always existed throughout the history of humankind. However, digital media (via the internet) facilitate the creation and dissemination of relationships between people. Communities that we might call "liquid" (Bauman, 2000), because of their flexibility: easy to connect to and disconnect from. They are communities that revolve around common interests, which Gee (2013) calls affinity spaces:

> People can enter such spaces (which are often sites on the Internet) and contribute in many different ways, large or small, with different people for different reasons. They are places where people can go to share resources and values and flexibly form and re-form in different groups. The place or space can be an Internet site, a real place, or a combination of the two (p. 174).

A Facebook group relating to a sports team, a game or a singer would be examples of liquid communities of interest. They can also be social movements such as, according to Castells, the first informational guerrilla: the Zapatista movement in Chiapas, Mexico, or other recent social movements such as the Arab Spring and the Egyptian Revolution of 2010-2011 and the indignados [The indignant] in Spain which emerged as a visible movement, the Movimiento 15-M on the 15th of May, 2011 (Castells, 2012). So these various "common interests" can differ substantially: centring on political or religious causes, on a play, a pop group, on a theoretical perspective or field of knowledge, on a country, etc. What all of these new groups or communities seem to share is their flexibility and across-the-board character over other more rigid collectives that are governed by vertical and hierarchical structures, such as political parties or religious groups. Also, what underpins communities is not necessarily a rational discourse or theoretical idea, but an interest, a willingness, that enables the affective bonding of the group: solidarity with a cause, be it a game, a political struggle or some specific knowledge. This is an aspect linked to the specific mechanism that explains the acquisition of language, communication and cultural transmission according to Michael Tomasello (2014), that is to say, shared intentionality: the capacity, motivation, ability that drives us to share goals and intentions with others in collaborative activities as well as sharing experience through joint attention, cooperative communication and teaching. These liquid communities of interests are based on the fact that we share experience simply for the sake of sharing them, a feature that appears to be exclusive, or at least particularly developed, in our species. And we might add that this also becomes essential in an environment in which there is so much information and knowledge that it would be utterly impossible for a single mind or person to deal with. This brings us to the last characteristic feature of the MCS: distributed knowledge.

In the TV-centric and even the PC-centric society, or at least in its beginnings, knowledge had a location – "it was known" – and the individual passively absorbed and received it. There was the well-defined figure of the expert – "the teacher" – who became the transmitter of this knowledge that responded to a solid society, with the school being the custodian and transmitter of such knowledge. However, since the 1990s, the flows of information reached such proportions, because of the internet, that people, or schools, or encyclopaedias, could not keep up with the available updates in knowledge and thus, soon lost relevance and became outdated. Largely due to services like Twitter, for example, information is updated in real time, surmounting the traditional operation and the flow of the press of the TV news. According to some theorists, such as the aforementioned Jenkins and Gee, the end product of this is the emergence of a new social mind or identity, which is the result of the summation and distributed collaboration of people and cultural artefacts. Currently no person can absorb all the information and knowledge available. Therefore, by sharing resources and combining skills, people arrive at knowledge and a "collective intelligence" (Jenkins, 2006) is constructed. According to Gee (2013), this is a Mind (with a capital M) as opposed to small, individual minds. "A Mind is what you get when you plug minds and tools together in the right way" (Gee, 2013, p. 165). A Mind is synonymous with a set of devices and people working together for a common purpose, interest or purpose: sharing an objective; i.e., the type of relationship we mentioned previously with the label liquid communities of interest.

The characteristics we have described are not disconnected from each other, nor do they represent an exhaustive list of MCS characteristics, but we believe they are relevant to our understanding of the main features of the cultural ecology (modes, uses and practices) generated by mobile digital devices. Ultimately, they help to place the shared and diffused relationships and experiences of people at the centre of our analysis, as well as recognizing the multidimensionality of contemporary cultural "prostheses" characterized by the incorporation of nanotechnology and digital culture in everyday tools and devices.

b. Formal education in the mobile-centric society

Faced with this new society and culture, briefly discussed above, the first challenge for formal education is to ask ourselves what kind of person needs to be "constructed" in order to meet the demands of the MCS and to allow them to move freely in it.

	Educational action focused on universal schooling (the "encapsulation of learning")	Educational action distributed via networks ("lifelong learning")
Social purpose of the school	Traditional education - retrospective: absorb the universal pattern, cultural tradition and the intellectual tools associated with it.	Modern Education - foresight: learners address issues that do not yet exist at the time of learning.
Nature of knowledge	Results and solutions already known.	Authorship (productive knowledge). "Creating & sharing".
Where and with whom	Formal educational institutions ("school") with educational professionals , the "teachers".	Multiplicity of educational scenarios and agents. "Distributed knowledge"

When?	Principally, the early years of life.	Necessarily lifelong.
What?	Stable, solid, socially valued cultural knowledge.	Basic competencies or skills for the 21st century (knowledge management, digital literacy, teamwork, networking and flexibility).
What for?	To be able to develop, subsequently, a personal and professional life project.	To become competent learners able to continue learning throughout life.
How?	Through deliberate, systematic and planned educational action (teaching).	Through participation in communities of interest, practice and learning. "liquid communities of interest
Literacy ("The medium is the message")	Predominantly technologies based on the written language and the skills required for use them (learning to read and write).	Using different languages and ways of representing information (predominantly visual and symbolic language) derived from digital ICT as gateways to information. "Multimodality" and "convergence"

Table 1. The coordinates of the new learning ecology. Source: Adaptation of Coll (2013, p. 32) and Kozulin (1998)

What seems clear is that to talk only of academic and school content is insufficient. Such content currently becomes outdated at breakneck speed; it is expanding and being distributed in different places, beyond classrooms, libraries and encyclopaedias. There are a multitude of scenarios and experiences that can easily become learning resources linked to the different interests and needs that appear at different times of life, especially those linked to the now frequent career changes, or to social networks. As Banks et al (2007) say, the learning that takes place today, more than ever, inside and outside the school, is life-long, life-wide and life-deep learning.

Of course the content is still relevant, but we must be honest in discussing it. If it is not possible to take on all the available knowledge, if much of it will be learned outside of school and, furthermore, if knowledge is no longer "stable", then we must consider what is basic and essential. César Coll (2009) calls it "the essential basic learning", i.e. that which, if not attained by the end of basic education, will have an adverse effect on the personal and social development of students, compromising their future life projects and placing them at risk of social exclusion. This learning is generated from specific and concrete content but the emphasis is no longer on the nature of such content but on conveying the skills and abilities required to use it.

Skill / Competence	Contents
Fluid Intelligence	Critical thinking (analyzing the positive and negative factors involved in any reality), problem solving, analysis-reasoning-argumentation, decision making, executive function.
Crystallized Intelligence	Information literacy (research using evidence and recognizing bias in sources); literacy in information & communications technology and oral & written communication; active listening.
Creativity	Innovation (creating new products by combining existing knowledge in new ways)

Intellectual and Social Openness	Flexibility, self-direction, personal and social responsibility (including cultural awareness and competence), artistic & cultural appreciation, appreciation of diversity, continuous learning, intellectual interest and curiosity, perseverance, productivity, Type 1 self-regulation (metacognitive skills, including forethought, performance, self-reflection), integrity, citizenship, career orientation.
Positive Core Self Evaluation (emotional flexibility, learner identity)	Type 2 Self-regulation (self-monitoring, self-evaluation, self-reinforcement). Manage and integrate learning experiences.
Teamwork and collaboration	Communication, collaboration, teamwork, cooperation, coordination, interpersonal skills, empathy/perspective taking, trust, service orientation, conflict resolution, negotiation, assertive communication, self-presentation, social influence with others (persuasion).
Synchronized Intelligence	Well-coordinated work among humans and tools in the service of a better world (i.e., the product of minds working well together).
Digital Literacy (Participatory Culture as a new form of literacy)	Cultural competences, social and analytical skills that young people need in the new media landscape from the individual level to community involvement. Competence in digital media (traits of the "Internet Galaxy" [Castells] and fluency development: programming, web design, image creation, digital video production, publication preparation, database authoring and design, robotics). Competence in the new self-initiated learning processes: (1) seeking out text-based information sources – able to identify and read internet-based information; 2) the creation of new interactive activity contexts such as projects or complete tutorials; 3) the pursuit of structured learning opportunities such as courses or joining clubs; 4) the exploration of media – able to surf the web, experiment with programs, and 5) the development of mentoring or knowledge-sharing relationships (e.g., by joining special interest groups).

Table 2. Skills/competences required to be a competent learner in the mobile-centric society. Source: Adaptation of Barron (2006), Castells (2001), Gee (2013), Jenkins (1996) and the National Research Council (2012)

Having clarified why formal school education or action is necessary, we need to illustrate educational practice that is consistent with that objective. In brief: the goal of the school institution is to prepare competent learners who are able to continue learning throughout their lives. That is to say, learners who can develop the skills/competencies listed in Table 2: fluid, crystallized and synchronized intelligence; creativity; intellectual and social openness; positive core self evaluation (learner identity), teamwork and collaboration, and digital literacy. Now we will briefly describe some examples of educational practice in action to illustrate what we think should be part of the updating of schools in line with the demands and architecture of the MCS, as well as skills/competencies - and content - that appear in Table 2. We should point out that the various experiences have two things in common, namely:

1) The recognition and use of the digital resources, strategies, languages and artefacts that students deal with in their own lives (their "digital funds of knowledge and identity" [Esteban-Guitart, in press]);

2) The establishment of continuities between school practice and culture with the routines, interests and lifestyles of the students, resulting in the articulation of different learning contexts in which children and young people are active participants, i.e., Bronfenbrenner's (1979) notion of a mesosystem (for an extension of this idea, see Esteban-Guitart, 2013; Gifre & Esteban-Guitart, 2012, Vila & Casares, 2009).

Digital funds of knowledge and identity

The funds of knowledge approach (Gonzalez, Moll & Amanti, 2005) is an action/research proposal which was developed in the early 1980s, in Arizona (USA), by a number of educational psychologists, anthropologists and educators. The basic objective consists of strengthening family-school ties by means of teachers visiting the homes of their students in order to detect, via ethnographic analysis, their funds of knowledge, i.e., the knowledge, abilities, skills, and social networks of support, collaboration and mutual lending available to families to maintain their wellbeing. Once detected, this "intellectual heritage" (knowledge connected to, for example, agriculture or construction) is used as an educational resource. Teachers, with the help of researchers, design educational activities linking the spontaneous knowledge of the students (the detected funds of knowledge) with the scientific concepts of the school curriculum (Esteban-Guitart & Vila, 2013; McIntyre, Rosebery & González, 2001).

Recently, a new concept, called funds of identity, has been proposed aiming to clarify that the funds of knowledge available to a particular family are not necessarily the same ones constructed and appropriated by a particular child. That is to say, children can – through their relationships with peer groups and through informal learning experiences mediated by technology – create their own funds of knowledge which may or may not incorporate the family funds of knowledge. When this occurs, we can use the term funds of identity, i.e., the knowledge, skills and support relationships embedded in the child's own definition of themselves or whatever constitutes the field of meaning: which, for the child, is whatever is meaningful and relevant (Esteban-Guitart, 2012, 2014, Esteban-Guitart & Moll, 2014a, 2014b).

In this sense, González-Patiño (2011) has documented in a case study, the routines mediated by digital devices of a 12-year-old girl from a wealthy social class. In this study, the multimodality and penetration of digital media was illustrated in the lifestyle of the participant. González-Patiño also carried out, during the academic years 2010-11 and 2011-12, a research-action project designed to strengthen the relationships between families, teachers and pupils aged between 3 and 6 years. The instrument used in this project was a class blog in which parents as well as students and the teacher could participate (González-Patiño, Poveda & Morgade, 2012).

In the same vein, Lisa Schwartz of the University of Arizona produced a doctoral thesis which is based on the need to recognize the way social media and digital tools are used so that they can be incorporated – as students' funds of knowledge – into school practice. Specifically, one of the interventions involved incorporating the interests, practices and experiences of Hispanic students in the development of a social network in an English class for 11th and 12th graders. The students themselves created the virtual space, and shared videos, music and artwork. Students left comments on the creations and contributions of their classmates using English, Spanish and internet slang. The study was able to document how multiliteracies which were visual, written and oral (Reyes & Esteban-Guitart, 2013) can converge into a distributed and collaborative practice based around a Wiki or the creation of digital storytelling (Moll, Soto-Santiago & Schwartz, 2013).

According to the notion of funds of identity, this involves teaching and learning activities in formal school situations based on the creation and mobilization of "identity texts" (Cummins

& Early, 2011) i.e., artefacts created by the pupils themselves which can be transported from school to home, from home to friends, etc. (Esteban-Guitart & Moll, 2014b). Examples of these would include an identity drawing, a bilingual digital book on a topic of interest for the pupil or publishing and distributing a video about a pupil's family or aspects of their culture that they consider to be relevant.

"Connected Learning"

With financial backing from MacArthur Foundation under the label of "Connected Learning", other researchers, such as Mizuko Ito (as main researcher), Kris Gutierrez, Sonia Livingstone, Jim Penuel and Julian Sefton-Green have proposed an approach to education which, based on the use of digital and electronic media, aims to connect the learning that takes place inside and outside of school. The "connected learning" concept begins with the premise that learning is generated out of interest and with the support of others; the challenge is to connect this to academic activities.

"Connected learning is realized when a young person is able to pursue a personal interest or passion with the support of friends and caring adults, and is in turn able to link this learning and interest to academic achievement, career success or civic engagement. This model is based on evidence that the most resilient, adaptive and effective learning involves individual interest as well as social support to overcome adversity and provide recognition" (Ito et al., 2013, p. 4).

Thus, three crucial aspects of learning are taken into account: 1) peer-supported learning – which takes place within the informal spaces where the peer group (friends) share activities, help and support each other in different experiences; 2) interest-powered learning – in which the student's own interests make the task, the activities and the content relevant and meaningful; and, finally, 3) academically-oriented learning – which links these interests and social relationships of support and cooperation with the curriculum (i.e., academic studies) as well as with civic engagement and professional careers.

Digital media can become powerful educational artefacts given that they are production-centered (they provide opportunities to produce and create knowledge, experience and content); they have a shared-purpose (they bring together similar interests and aims) and they are openly-networked (existing on online-offline platforms that facilitate the team work). In informal learning situations – using digital media – anyone who wants to can become involved, learning is part of meaningful activities and projects, the challenge is constant and everything is connected: "Young people are provided with multiple learning contexts for engaging in connected learning – contexts in which they receive immediate feedback on progress, have access to tools for planning and reflection, and are given opportunities for mastery of specialist language and practices." (Ito et al., 2013, p. 12). That is to say, digital media, which form part of the routines and lifestyles of the students (González- Patiño, 2011), encourages involvement, self-expression and self-creation, provides access to knowledge and learning experiences, builds social support through shared interests and issues and increases the participation of non-dominant groups.

The work led by Erstad, closely related and in line with connected learning (albeit using another concept, "Learning Lives") illustrates the learning trajectories that pupils experience

outside of school. These domestic, affective, informal or out-of-school learning experiences involve the use of digital media and are based on popular culture (Erstad & Sefton-Green, 2013). The term "learning lives" refers to the idea that learning is an ongoing process, embedded in a wide range of experiences, across a wide range of online and offline social domains ("the pedagogicization of everyday life"). It also takes on board the idea that people learn for life, that is, in order to be competent in a liquid and digital society (the so-called 21st century competencies such as ability to learn together, co-operation and negotiation, self-regulation, meta-cognitive skills, among others; see Table 2). As with the philosophy that underlies the concept of funds of identity and the connected learning approach, the idea is to reposition, recognize, and use educationally what Cohen (1990) called "really useful knowledge"; i.e., those kinds of experiences, ideas, practices and knowledge that young people find meaningful and valuable within the exchange of various kinds of youth culture. For example, the Street Art project – a project involving graffiti in urban spaces in Oslo, which consisted of creating a portrait of two local graffiti artists by means of a TV documentary (Erstad, Gilje & Arnseth, 2012).

An integrated example of how the connected learning philosophy can be applied can be found in a public school opened in 2009 in Manhattan (New York) called "Quest to Learn". This is the first school in the USA whose entire curriculum is based on games or learning from projects, as well as being a school that aims to incorporate the principles of "connected learning". Some examples of the school's activities include building a sculpture with recycled materials, building a Rube Coldberg Machine, designing a travel website featuring three NYC neighbourhoods and a number of other activities which can be seen at: http://q2l.org/. Work usually takes place in groups based on challenges and students can, usually, incorporate their own interests. For example, the teacher may ask students to work on a project based on writing and performing short stories inspired by the interests and cultural forms from their out-of-school lives. Thus, popular culture (books, video games, music, movies, etc.) form part of the curriculum and the students' funds of knowledge and identity are incorporated into the task.

> "One scene took place in a medieval coffee shop called "Moonbucks"; plots and characters drew inspiration from popular books, video games, music, and movies; several students with an interest in fashion worked on costumes; a student who was enrolled in an afterschool program for gymnastics helped choreograph stage fights; students who participated in online fan fiction communities worked on scripts; students who were interested in media production helped with recording and mixing sound effects; all students produced daily podcasts that provided updates about their projects to family members" (Ito et al., 2013, p. 36).

The Quest to Learn school gives academic legitimacy to the creative activities, experiences and interests that come from the students' informal culture – a culture which is usually absent or marginalized in mainstream schools. Building the Rube Goldberg machine, for example, requires a knowledge of physics and scientific thinking. Typically, the challenges consist of doing things collectively that one cannot do alone. "Instead of rotating between different academically-themed classes every 45 or 90 minutes, students work for several hours at a time on their projects, moving fluidly between intensely focused work and more casual genres of practice, such as messing around" (Ito et al., 2013, p. 37). Another feature of the school is the involvement and participation of institutions and individuals in the

neighbourhood such as the MOMA, the Nuyorican Poets Café, the Museum of the City of New York, a professional Flamenco dancer or a Parkour expert.

Obviously, using games, including video games, as an educational device is not new. There are numerous examples of this in educational settings, such as the programme developed by Michael Cole called the "fifth dimension" (Cole & Distributed Literacy Consortium, 2006) or, more recently, the use of games in formal spaces, including commercial games (Lacasa, 2011) as well as games created for the occasion. A prime example of this is the "Quest Atlantis" project, led by Sasha Barab, (Barab, Gresalfi & Ingram-Goble, 2010). This is an educational experience for children between 9 and 16 years of age, in a video game environment for developing educational tasks through projects or questions (the Quest) as curricular tasks. The students have to participate in simulated and real activities while communicating online with classmates and teachers. The various virtual scenarios include issues such as, for example, water quality, astronomy, time or urban ecology. For example, a world called Taiga was designed specifically as a curriculum unit that could be used to address the issue of water quality. To resolve the various tasks and problems, the students need to understand various phenomena such as erosion or eutrophication (nutrient enrichment in an ecosystem), i.e., they need to understand "scientific concepts" in Vygotskian language.

As argued by Gee (2003), video games often provide their users (or players) with strong identities, that is, players learn to see the virtual world through the eyes of another identity, along with different values and behaviour (e.g., Solid Snake in Metal Gear Solid). The player is the protagonist and is responsible for making decisions and solving the various problems that are generated. Such a role is known as a "person with intentionality" in the theoretical model of "transformational play" proposed by Barab et al (Barab et al, 2010.) and the game takes on a similar structure to that of the scientific method: "hypothesize, probe the world, get a reaction, reflect on the results, re-probe to get better results." In the case of Quest Atlantis, in addition to solving problems, the players must also understand and apply academic concepts ("content with legitimacy" Barab et al., 2010). The users play an active role: through their actions and decisions in response to the exciting challenges and quests, they obtain answers and modifications, e.g. new scenarios in the game. This is what Barab et al. (2010) call "context with consequentiality", i.e., the context is modifiable and the decisions of the protagonists have consequences and social impact. This brings with it a real sense of agency and control. In the end, players become protagonists by using their knowledge, skills and the concepts of the educational content they have acquired in order to understand a particular situation, make decisions and thus transform the scenario of the game and themselves.

Networked individualism and Personal Learning Environments

According to Castells (2001), the Information Age, which we have referred to here as the mobile-centred society, (MCS), favours the emergence of a social model that the author calls networked individualism. This consists of individual people who, on the internet, constitute their own networks of interest and affinities and their own groups and circles. In this sense, through personal blogs, or more so via digital hubs, users can integrate access to social networks and applications, as well as publish texts (writings, pictures, videos, etc.) and thus create an authentic identity artefact. Indeed, the user's digital media is converted into their

distributed identity; the user's devices can be personified, incorporating and integrating their needs, interests and experiences.

At the level of education, the Personal Learning Environments (PLE) are perhaps the embodiment of Castells' networked individualism. PLE is a relatively recent term, which appears to have been coined in 2004, in "The Personal Learning Environments Sessions at JISC/CETIS Conference". Since then, they appear to have become a tool for helping students to take control of and to manage their own learning trajectories, allowing social networks to be used, linking formal and informal learning experiences and using network protocols (peer-to-peer, web services, content syndication, etc.) which enable resources and links to be connected in a personally-managed space.

III Conclusion

Of the approximately 47 million inhabitants in Spain, 62.9% were internet users in 2012 (about 21.1 million people). Internet use is particularly strong among young people: 96.2%. of people aged between 16 to 24 are internet users. In addition, 55.4% of internet users between 14 and 19 years of age go online via their mobile phones, a figure that is thought to be increasing (Fundación Orange, 2013, Fundación Telefónica, 2013). According to Tubella, Tabernero & Dwyer (2008), the digital culture among young people is characterized by the practice of multitasking, i.e., the simultaneous use of internet, mobile phones, television viewing and sometimes reading or personal conversation. The authors summarized this as follows:

> "Within the dynamic process of a general transformation in the management of our time and a wide variety of our daily activities, we find ourselves in a context of transition in which traditional communication practices coexist with an active renovation of uses and strategies, characterized by autonomous and personalized management, which is being carried out largely by the younger sections of the population, for whom computer use and internet access are preferable to television. With the internet at home, audiovisual consumption has become specialized and is diversifying into a multimodal, multi-channel and multi-platform universe" (Tubella et al, 2008, p. 188).

The school cannot remain on the sidelines, excluded from the lifestyles of students. On the contrary, it needs to recognize these changing lifestyles and be responsive to them in educational practice. It is therefore highly important to clarify the general features underlying the social and cultural transformations that shape our lives and this is precisely what we are aiming to do by using the term mobile-centric society.

In an interview published in the Argentine newspaper, La Nacion, the Italian teacher, Francesco Tonucci, asserted that "the primary mission of the school is no longer teaching things" (La Nacion, Wednesday, December 29, 2008). Video games, the internet, mobile phones and television do it better, are more attractive and more responsive to the needs and interests of young people. "We must avoid students getting bored in school," said Jerome Bruner, in an interview published in El País newspaper (Monday, April 9, 2007).

Both Tonucci and Bruner seem to agree that a school model based on transmitting a stable culture and a stable body of knowledge - the "encapsulation of learning" as we called it in Table 1 – is now outdated. In this sense, one of the more important current revolutions in educational sciences is the need to break down the barriers and boundaries between what is done in school and what is done outside of school – the connected learning of Mizuko Ito et al at the Connected Learning Research Network.

None of this is new. Vygotsky himself referred to this idea, as did Bronfenbrenner, of course, and it is a guiding principle of the funds of knowledge approach. This initiative implies an implicit recognition of the knowledge, practices and skills of the students, their families and communities; and using this as a platform on which to base educational activity and action. It means, in short, constructing a continuum between school and society, the students and their lifestyles.

Tonucci also states, in the aforementioned interview, that it is important to find a place in school practice for mobile phones, newspapers, television and video games in order to discuss issues of the here and now. Schools should be stimulating contexts that encourage cultural and intellectual interests, scientific and artistic appreciation and reasoning. "The school should not have to compete with much richer and more capable instruments. It should not be thought that its role is to teach things. That role is better carried out by TV or the internet. The school should be a place where you learn to manage and use technology well, where a method is transmitted for working and for scientific research, where critical understanding is encouraged and where people learn to cooperate and work together"(La Nación, Monday, 29 December 2008).

For Bruner, this means replacing the content – what we know about the world – with the various options available in terms of how to proceed and an awareness of these options. In short, it requires stimulating epistemological curiosity and sensitivity that individuals show from a very young age: What's this, Dad? How does it work? What does that mean?

> "Education is not and should not be devoted exclusively to the transmission of established knowledge. It should also dedicate itself to cultivating awareness of the human condition and to generating skill in understanding the nature and sources of knowledge. That is to say, education is not only about mastering content, but also about gaining insight into the nature of knowing and understanding. Yes, I am saying that we should cultivate an appropriate epistemological sensitivity in our school children, an awareness concerning the processes involved in learning and thinking and not just in the finished products that we call a curriculum. It is absurd to say that children are not capable of understanding such matters. Their spontaneous play activities are full of explorations of the possible, of what might be and why it sometimes is and sometimes isn't. I strongly urge that we cultivate that sense of the possible in our educational practice" (Bruner, 2012, p. 12).

Nowadays, people make their way through different scenarios – real and virtual – that are susceptible to becoming learning experiences. We have attempted here to illustrate a number of educational practices that are intended to fortify and recognize these paths, and to describe the strengths of digital media as teaching and learning tools. The incorporation into schools of computers, mobile phones and tablets is not the point. The real question is the transformation of the practices, the uses and ways of understanding what takes place in schools. To paraphrase Ausubel's apt expression, we could say that the most important thing

is to understand what the pupil already knows and does. From this point on, the objective is to place the interest at the centre and, around it, the tasks, activities, and meaningful contexts, because good meaningful learning is always derived from a meaningful situation or practice. And by meaningful situation or practice we mean an experience that, emotionally, will help the student to awaken and activate their learner identity (Coll & Falsafi, 2010). In this sense, the school can broaden its use of the web, newspapers or video games, for educational purposes: teaching children to be competent in the use of these, and other, media. And not only this; they can also raise awareness and explain the learning processes so that these can be controlled and adjusted to the needs of learners. In itself, the content is irrelevant and unnecessary. What is relevant and necessary are the psychological processes of creation and the negotiation of meaning involved in different languages used in school and in reality. Certainly this must be carried out by means of the content, but this content should not be considered as an end in itself but as a means to an end. And when we talk about raising awareness and explaining, we do not refer only to fostering reflective processes about learning, but also to fostering a critical reading of the artefacts that constitute the present-day "cultural diet" (del Río & del Rio, 2008) that feeds our minds. It is certainly beyond our purposes in this article, but there is a pending need for a profound reflection on the nature of the person, the individual, who is a member of the mobile-centred society. And not only the positive aspects, but also the negative: individualism, for example, albeit networked individualism; the narcissism and superficiality that can be found in certain digital and other media, or the lack of commitment that a liquid society can encourage, where relationships are made through a common interest and unmade without prior notice. Of course, the artefacts in themselves are neither good nor bad, as it all depends on the use that is made of them. But it is perhaps the school that is the only institution designed for and capable of bringing about a genuine digital literacy that will enable us to expose the good and bad that may be hiding under the mobile-centred society that is shaping our minds, our identities and ours ways of learning.

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