# Chapter 3
# Digital Screens and Issues of Multiliteracies' Learning

*I cannot teach anybody anything,*
*I can only make them think.*

Socrates

**Abstract** Digital screen is the main pattern of the digital revolution. Around the world schools and universities, changes printed pages in favour of digital screens, creating innovative platforms for learning and assessment methodologies, however many others keep the traditional approaches of teaching and printed textbooks. The new paradigm of learning is focused on development the vital competence for sustainability. Although educational system has been opened by the globalisation, the diversity of digital screens is a big challenge for this process. How digital affects the opening process of the educational system and, therefore, changes the behaviour? This scientific question inspired the ideas presented in this chapter. The aim of this chapter is to compare the features of digital screen with the intention of multiliteracies' learning.

**Keywords** Digital screen · Digital natives · Behaviour · Multiliteracies

## 3.1 Introduction

Openness, nano-learning and networking of the pedagogical systems form the conceptual framework of the modern education. Books, textbooks, television, radio and classrooms are 'converging' into new patterns for learning. The foregoing scenario is only for a short period because of rapidly changing paradigms. The question it raises it 'Will the actual students of law, medicine and economics in ten years' time be equipped to enhance the contribution of the profession in the circumstances described above?'. To make a judgement of this, it is necessary to

consider not only technological, but also the philosophical, psychological, peda-
gogical and other paradigms that command the complex process.

Digital screens has used to display and shared data for the most effective dis-
semination of information. In reality, we see many students using digital for gaming
or social media. They don't want to read or to learn something new. If it is expected
that digital textbooks is a tool enabling to engage students for active participation in
the learning process, we should understand that students should be motivated
enough for this.

According to finding of MacArthur Foundation project, the way in which young
people learn, play, socialize, and participated in civic life is changing considerable.
However, there are *direct* and *indirect* impacts on learning. On one hand, using
digital media allows freedom and authonomy or youth that is less apparent in a
classroom setting (e.g. direct impact). On the other hand, digital communication
have altered: picking up the basic and technological skills in curriculum and/or
extra-curriculum activities; increasing various kinds of social connotations within
friendship-driven and interest-driven online participation; and learning from peers
and not from teachers and adults, which framed negatively development of
behavior.

Youths' participation in networked world suggests new ways of thinking about
user interface design (e.g. indirect impact). Furthermore, digital screens can be an
ideal place for collaborative assessment, as a context for learning. The problem is
that printed textbooks cannot be used within social media and education 3.0
paradigm. The paradigm changes the way in theory and practice of design thinking
and, therefore, should propose a new learning theory.

Education 3.0 is a connectionist and heutagogical approach of user-generated
content. Digital content of the textbooks are displayed as: (a) *text*—scrolling text—
interactive text—adaptive text etc.; (b) *images*—scrolling images—interactive
images—adaptive images; (c) *videos*—interactive videos—adaptive streaming—
3D film; or a (d) *multimodal* text, which combines two or more semiotic systems,
like linguistic, visual, audio, gestural and spatial. Moreover, instead of printed text
that allow only one communication, digital textbooks allow two-way communi-
cation (e.g. hypertext) or three-way communication (e.g. hermeneutic dialogue)
with the users In all cases the content of the digital textbooks should be *responsive*.

The term 'literacy' defines the ability to read, to write and to use arithmetic
(Barton 2007). More recently this term appears to be a synonym of tangible skills
for writing, reading, oral communication and calculus. Cope and Kalantzis (2000,
p. 9) consider that literacy pedagogy is restricted to formalised, monolingual,
monocultural and rule governed forms of language and that it is important to have a
broaden understanding of this term, taking into account not only the content, but
also the context for learning. Thus, pedagogy must account for the burgeoning
variety of text forms associated with information and multimedia technologies.

## 3.2  Multiliteracies and Online Textbooks, Systems, Platforms, Screens, Channels, and Apps

The term 'multiliteracies' is used to focus pedagogy on finding adequate solutions for the problems of linguistic diversity, and multimodal forms of linguistic expression and representation. However, although academic institutions are developed the technological infrastructure and support this investment, in fact, these investments are not related only on multiliteracies. The most of the students are using special languages, both for reading and writing, 'developed' in virtual environment. These languages are more attractive for them; although in schools are thousands of lessons every year. What is the reason?

There are many reasons, but one of the most important is that education is more focused on direct or systemic consequences of instruction and assessment that on identification the issues and developing the adequate solutions. The grammar is no longer needed for students and the cognitive filters are blocked all information regarding the rules? Or, maybe the strategy or methods used by teachers is so old, that students are trying to find other, more innovative way for learning like self-regulated learning, as was observed by De Corte (2016). Maybe, from this reason they are looking for some other textbooks, those content is more compact, have a higher level of organization and is presented in a more logical way.

On the other hand, technology has proposed various knowledge management systems, platforms, screens, apps and other innovations that are more attractive than the bored lessons in schools and universities. However, if the knowledge management systems are mainly used by teachers to disseminate the content in a virtual environment. Both teacher and students use all others because it is more available, visually attractive, and in some cases, it is easier. In plus, same teachers use platforms to develop own textbooks, e.g. Khan Academy, Ridero etc.

Developing own textbooks on the base on available on-line platforms is a global phenomenon. As was noted by Blaschke (2012), education proposed a special form of self-determined learning 'heutagogy', with practices and principles rooted in andragogy, learners are highly autonomous and self-determined and emphasis is placed on development of learner capacity and capability with the goal of producing learners who are well-prepared for the complexities of today's workplace. A key concept is heutagogy is of double loop learning and self-reflection. In double loop learning, the learner consider the problem and the resulting action and outcomes, in addition to reflecting out the problem-solving process and how it influences the learner own beliefs and actions. Heutagogy is a bridge between self-directed and self-regulated learning. However, if the traditional pedagogical model is 'teacher→learner directed', the heutagogical model is learner directed. However, the capacity to self-direct learning is not genetic and, therefore, getting students to know how to learn is not enough. First, they need to be engaged in a powerful learning environment in order to motivate and, second, they need to keep this motivation for learning. Third, it is very important to develop such 'structure' of competence that will keep the motivation for all life (e.g. life-long learning).

Education textbook market is stuck between several countervailing trends. On one hand, the professors and their students are still use printed textbooks as the core reading resource, but also interactive whiteboard for teaching and assessment. At the same time, they use digital and digitalized textbooks for self-directed learning. Moreover, some of professors customize the digital content according to students' needs or learning styles. In addition, teachers and students have much more ways to get the needed content via digital libraries, repositories or/and open source textbooks, that were not available a decade ago.

Dispute the widespread assumption that digital media are changing the ways in how student's brains are learning in various learning environments, screen, channels; there is a hot area of research related on changing behavior that indicate toward a new pedagogy for multiliteracies (The New London Group 1996; Luke 2000; Cope and Kalantzis 2000, 2009; Selber 2004; Anstey and Bull 2006). Rapid evolution of the digital revolution require changing the terms 'literacy' and 'literacy pedagogy' taking into account that the term 'multiliteracies' defining skills to gain knowledge through technology, as well as the capacity of the lifelong learners to learn for well-being in a digital society.

As was noted by Cope and Kalantzis (2000, p. 19) the metalanguage of the multiliteracies is based on the concept of 'Design', meaning that teachers and managers are seen as designers of the learning processes and environments. This means that the pedagogy should interrelate with the domain of design science, taking into account the differences between cultural, pedagogical and classroom designs models and patterns. Therefore, the increasing multiplicity and the integration of the various models of meaning for lifelong learners indicate that students' patterns for learning already have integrated in a holistic whole the visual, the audio, the spatial, and the behavioural patterns.

Anderson (2011) notes that digital displays are essential tools for supporting students learning and making the classroom feel welcoming and engaging. The best way to archive these results is to include everyone in a *digital learning environment*, in which interactive whiteboard and digital textbooks form a holistic whole. For this, digital screen allows displaying work from every children as well as drafts and finishing work side by side, giving students a say about what you highlights makes displays more interesting to them, reinforces their efforts, and fosters a feeling of community as they see that the classroom is something they create together. Moreover, putting pieces at the student's eye level. It is very important to choose the right space, to control clutter and to keep displays fresh. Therefore, overdoing displays, even those of students' work, can overstimulate children and interfere with your efforts to create a calm classroom environment.

Today, in many countries of the world, leaders have discussed the challenges of making the transition from paper to digital in very short time. Digital means, among others, using of the *digital devices* in all schools and universities. Instead of the learning with printed textbooks, that is only an object for reading; a digital textbook on digital device has the potential to establish a *digital learning environment,* which may be an indicator of active learning in an environment with interactive whiteboard, educational software, digital textbooks and *active learners*. The active

learners are those that are able to initiate, to plan, to implement, to control, to evaluate and to apply their learning themselves. For this, as was noted by Peters (2000), not only factual knowledge is important, but also competence in using the methods of obtaining it as well as competence of co-operating with others. Therefore, in a digital learning environment, several presentation methods can be combined and integrated; multi-sensory instruction can be strengthened; interactivity can be extended quantitatively and qualitatively and support system can be extended and improved.

Moreover, in a digital learning environment is used many digital objects for learning. However, when a physical unit of equipment (e.g. a device or a whiteboard) has integrated with an educational software the teacher/learner has more than a physical object for learning. Indeed, such a unit has a *digital screen,* which is a special area on which media, images, text and data has displayed. Different screens have various sizes, features, and functionalities. In the most of cases, the user, even teacher or student, can easy manipulate the items by using his/her finger or a mouse directly on the screen for dragged, clicked, copied, deleted and sent through Internet. Thus, digital screens have used for interactive activities, and some—only for reading. How affordance of the digital screen affects learning?

The content of the digital screen is stored in various forms: PDF, HTML, and others. The problem of how these formats for active learning can be used in digital learning environment is now of considerable *pedagogical* importance. There are many possibilities. However, if on digital screen of students' devices is uploaded the PDF version of the printed textbooks, but on interactive whiteboard—presentation of concepts in an interactive, adaptive or flexible manner, during lesson the teacher will have the priority of interactive whiteboard.

Ideally, the digital features of the interactive whiteboard screen has repeated on students' displays. One of these features is *Apps,* which allows adding annotations, highlighting text, adding notes and drawing, labelling parts or highlighting elements of an image in a teacher-directed activity, even in learning with pdf versions of the digital textbooks. What effect do interactive features has on students' brains? For example, if it is used the tandem of Mobi View™ and students' tablets, a functional large LCD touch screen has the priority because allow teachers to control the lesson from everywhere in the classroom. On the other hand, with an effective method this tandem motivates students not only to absorb information, but also to create new knowledge at the level of understanding.

The other example has presented by Cinganotto et al. (2016, pp. 117–120). TEAL (e.g. Technology Enabled Active Learning), as an innovative teaching model to address several of educational problems: (a) in a lecture based courses in which lectures 'delivered' content with additional smaller recitation sections, the failure rates were high, as result of very low retention rates of core physical concepts, working in teams and developing communicative skills. This competence is needed to be developed in a more adaptive and flexible instructional environment. Therefore, the TEAL methodology employs the interactive group structure, as well

as two and three-dimensional visualisation, animations and simulations that allow students to explore and understand better the phenomenon, reactions and events. The best teaching/learning strategies in a TEAL environment are problem posing/solving to develop critical thinking skills; cooperative learning and discovery learning in small groups or in pairs; peer tutoring and peer learning and learning by hand-on experiments to develop active involvement in the learning process. Moreover, TEAL methodology refers on inductive methods from the observation and the practice to the conceptual frame; concept questions with individual reflection, peer discussion, corrective feedback from the teacher; challenges based learning, launching challenges to the students through a gamification process; project based learning working with the aim to produce a project through artefacts (e.g. video, tutorials etc.). In plus, there are very important to use experimentations, visualisations, simulations, task-based learning activities according to specific tasks and interactive presentations and Open Educational Resources.

Furthermore, in an university learning environment may be used *learning analytics*. As was written in Educause, with reference to *2016 Horizon Report the learning analytics* is an educational application of web analytics aimed at learner profiling, a process of gathering and analysing details of individual student interactions in online learning activities. Following the review of the scientific literature, it has to say that the learning analytics reveal patterns aims to improve learning for individual students as well as across institutions, predicting what will happen in the future and what methods is better to develop competence for future jobs.

In a digital society, learning is a part of the metasystems functionality for sustainability. In such a conceptualisation, the learner cannot be more view only as an empirical observer and experimenter, as was defined by Locke, or as a reader of the pictorial textbooks, as was identified by Comenius. Learner, today, has new aims, strategies, visions, and knows how and where is better for him to learn to be agile, adaptive and inventive. However, a diversity of digital screens, from interactive whiteboards to smartphones, used in formal and informal learning environments are giving rise to a new pedagogy of learning.

Nevertheless, what is the subject line of new pedagogy? It is a widely accepted that education is a key driving force for *sustainable development* of the world. Noguchi et al. (2015, p. 12) observe the emergence of the field called Education for Sustainable Development (ESD), characterised by active participation of the people in the development of a world for everyone and for social transformation of activities, knowledge, skills and values related on how learning takes place and how should be in the future.

As the digital revolution has increased the number of bits and challenges in education, many pedagogical questions aroused, also. Learning from a personal acquisition of knowledge in one domain to has transformed toward lifelong competency. Therefore, on one hand, the lifelong learning is important for sustainable learning environment and on other hand, the lifelong learning needs new (meta) cognitive self-development strategies.

## 3.3   The Main Features of a Learning Society

The term "learning society", coined by Hutchins (1969), refers on part-time education available to everyone throughout his life. Today UNESCO that positions education in the centre of formal, non-formal and informal movements toward a learning society quote this term. Building a learning society encompasses learning at all ages and in all possible formats. The proposed by UNESCO strategy 'Building a Learning Strategy' is driven by the principles of lifelong learning. Computers and digital devices are the fact of life in a learning society.

Textbooks with the previously established instructional objectives will continue to deplete in favour of digital textbooks. The learning society is a part of the sustainable world that face digital textbooks to provide the self-regulated potential in the next future. As was noted by Scheunpflug et al. (2016, p. 6) the global learning aims to change behaviour and attitudes toward learning for sustainability. Thus, first, encourages dialogue among businesses and organisation of the need to create living organizations in harmony with the natural and social world. In a sustainable world, human and natural systems can thrive together. In spite of these notes, provided by Laur et al. (2006, p. 3) many of the basic assumptions of pedagogy are scientific questions: What kind of information for students should be presented? How to transform information in sustainable knowledge and skills? What is the impact of technology on educational outcomes?

Now, we are living in the complexity of environments, challenges, technologies. Updating pedagogy for a sustainable development is the main condition in a learning society. How to ensure this condition? In practice, the design of learning environment remains only an individual or/and collaborative activity, which is a teacher-cantered or learner-cantered. Such conceptualisation cannot guarantee development of competency for a sustainable world.

Let us analyse the diversity of learning environments available in the last years. With the comparative methods could be easy observe that the thirty-two most innovative online educational tools to use in 2015 can be classified, as follows (Fig. 3.1):



**Fig. 3.1**  Eight categories of tools for learning
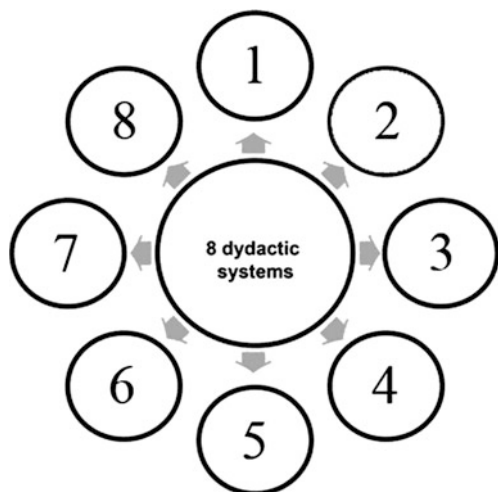
The categories of online innovative educational tools are:

1. *Classroom connections*—students, teachers and parents are login into all tools with a single set of credentials and do same activities (e.g. Clever, Edmodo, Kahoot!; Schoology, Skype etc.);
2. *Interactive Information Providers*—teacher(s) and students are get information that are better explained through videos, diagrams, explanations, sketches (e.g. BetterExplained; Desmos, etc.);
3. *Knowledge Graph*—teacher(s) and/with students are find information (e.g. text, videos, free video tutorials) in order to understand the meaning and for assignment through Voice Search, Carousel, instaGrok, Khan Academy; PatrickJMT, Wolfram Alpha;
4. *Language Learning Tools*—an intuitive, step-by-step learning progression that leads speakers through the basics of the language while gently challenging them and explaining key grammatical concepts like Duolingo, Pleco, SpanishDict and others;
5. *Online courses*—free access to free online courses of the best universities through digital platforms, like Coursera and Crash Course or free access to custom-design courses with assignments, materials, and study notes like iTunes U;
6. *Presentation Makers*—creation and sharing graphs through Plotly, make interactive presentation through Prezi; user-created flashcards like StudyBlue; creation of study materials like Quizlet;
7. *Productivity Boosters*—stay focused on same information or task with Cold Turkey; helps create an environment conducive to sleeping with f.lux; analyse the productivity of work on computer through RescueTime; enable to provide help like a friend or a family member with Unstuck;
8. *Reading and Writing Enhancers*—educational reading tools like LightSail, read free audio books with *Books should be free*; free online speed reading with Speeder; write poetry and other creative forms with Poetry Idea Engine and others.

The learning society in the digital age has characterized by the number of data and metadata, language and metalanguage skills, memory and metamemory features, cognition and metacognition skills as well as the ability to apply relevant competence for solving real tasks. In all these cases may be used various tools, resource, including digital textbooks. Therefore, if the content of the digital textbooks is open, the learners' minds have connected with the global learning rules, values and ethics. In a learning society, the content is flexible, interactive, and adaptive. The global environment is rich in (meta)cognitive activities and actions.

Across the globe, can be seen progresses in expanding open access for reading textbooks. However, the aspiration of students for comprehensive digital reading in an open environment requires to solving current-future pedagogical issues related on interdependencies between context, content, teacher and students. While development of textbooks contributes to greater interconnectedness between teacher, student, content and context for learning, pedagogy must find non-standard

ways of responding to such challenges, taking into account advances in contemporary science.

In a learning society is very important to find a new methodology of *teacher training*. As was noted by Lyashenko (2016, p. 244) the role of a teacher is more complicated because he/she takes not only the role to teach, but also the responsibility to create, to develop, to incorporate, to coordinate, to consult, and to share expertise with the learners. This means that teaching nowadays would require understanding of philosophical trends, students' characteristics, textbooks innovative features as well as the competence 'to combine' new technologies with the traditional ones. Therefore, pedagogy alone cannot solve all global challenges and provide updated solutions for sustainability.

Nevertheless, the learning society is moving toward a digital society (Hayes et al. 2016). The digital society is a progressive society that adopt the concept of sustainable development for living in a 'global village', composed by digital citizen thinking globally, but acting locally. These citizens have the capacity to learn how to access information through an online gateway that works 24/7, and boast the highly advanced telecommunications and wireless connectivity systems and solutions for living. Therefore, citizen of digital society are wellbeing because are adaptive on all challenges.

Digital citizen should have new and more affordable competence. What effect do digital text have on students' brains? Since at least the 2000s researchers in many different fields, including education, psychology, mathetics, and library and information science, and others have investigated this question in more than one hundred published studies (Cull 2011; Jabr 2013; Wollscheid et al. 2016). Thus, all published studies evidence the issue of the *exhaustive reading,* pointing that people understand what they read on printed-paper more thoroughly than what they read on screens.

Now, it is a well-known fact that the brain responds differently to onscreen text than to words on paper. Thus, reading is not a natural act and online digital text represents a revolution in human learning and communication that we are only beginning to understand. Students prefer to get textbook in a digital form, but to print them or, at least, some pages, to read. What is the reason? Definitely, digital technology changes the way of reading/writing the content. As was pointed by Jabr (2013), people are not born with brain circuits dedicated to reading. While an open paperback presents a reader with the left and right pages, and everybody can see where the textbook begins and ends, feeling the thickness of the pages read is in relation to that border, meaning has anchored to whole structure of the textbook. In contrast, digital reading allows searching meaning through highlighting and questioning, which is very different comparative with the printed version.

In addition, digital screen supports children's understanding more effectively, if the teacher direct the pupil's attention to specific points that have to be listening or/and watching, to specific parts of the spoken text or image and/or to develop activities that support understanding. The role of the digital screen is 'to make' as much as possible the effective connections between theory (e.g. scientific concepts from textbooks) and practice for deepen understanding through searching patterns

in the real world. One of this connections may be the production of transformed texts, a challenge that, according to Lenters (2016, p. 1) prove the practice to move away from literacy by design and toward literacy as emergence.

Indeed, everywhere it is expected a digital revolution with profound technological, societal, behavioural and even neurological facets. As was noted by Cull (2011) with reference on cognitive neuroscientist Maryanne Wolf (2008) it is expected a shift from the *reading* brain, which has been a hallmark of the human species for millennia, to the *digital brain*. Thus, the digital brain, while reading or writing a digital content, tries to minimalize the required cognitive efforts of multitasking, paratextual elements, and deep sustainable thought and, maybe, the culture of reading and writing. In order to do this it was used different 'technologies', the most important of them was changing the students' behavior.

## 3.4   Regarding the Issue of Outcomes in a Learning Society

Digital television, social media, social networking, knowledge sharing, online games, video-shared sites and using of various gadgets for messaging are now fixtures of youth. They have so much permeated the human lives, which it is hard to believe that digital technologies barely appears only six decades ago. The actual generation of students, who are born between 1980 and 1994 and claimed to be innovative and prone to changes, is 'Generation Y, Nexters, Echo Boomers, Net Generation and Generation Me' (Majid et al. 2016, p. 685). This generation doing so amid activities for digital networking that want to learn only with technology and Internet. What is the impact of textbooks on learning?

The availability of the digital devises technologies and Internet allows global news changing the ways in which students think and process information, making difficult to excel academically tasks and outdated teaching/assessment methodologies. Who are the students? Tapscott (1998) has observed that most of children of 0–20 years can be called "Net Generation", because they are extremely curious, self-relevant, contrarian, smart, focused, able to adapt, high in self-esteem, and have a global orientation. Students who grow up in a high-tech age and global economy will face a more complex world. For the "Net Generation" working and communicating in an interactive learning environment, both local and global is the best way to explore his/her potential in the world. Therefore, in an interactive learning environments students receive real feedback, which allow competence development.

Prensky (2000) wrote that these are *digital natives*, arguing that actual students have been interacting with digital devices from a very early age, raised in a digital world, gaming in a virtual environment and, the most important they do not like to read. For Howe and Strauss (2000) actual students is *millennials* who need a different type of educational experience. They are more numerous, more social educated, more ethnically diverse; but the most important fact is that, as a group they have an enormous potential power. This generation likes to use digital devices

for networking and to be mobile. They do not want to listen the teacher's speech repeatedly about scientific concepts, but intend to understand how theories work in reality.

Ramakrishna (2016) notes that *Net generation* students want to be unicorn in entrepreneurship, innovation and sustainability; they seeks personal fulfilment instead of mere job to care family; they are interested in travel and experience and they are plugged into global digital brain. In plus, Net generation students aspire to develop communication skills, multi-cultural skills, ethnic and social responsibility, interdisciplinary skills. This means, in our point of view, that for the "Net Generation" the printed content of classical textbooks soon will be obsolete. To avoid the failure of the learning in formal schooling, it is already proposed new ways, like a new format of courses: 'each course is broken into short segments of $\sim 11$ min that stretch over seven weeks online learning' (Philanthropy University) and digital platforms for global collaborations among different students around a single idea.

However, there are many research regarding psychological learning characteristics of the contemporary students. In order to thrive in/for the sustainable world, students need to understand how to work both individually with own IQ and collaboratively with collective intelligence. As was noted on ISTE (2016), solutions require tenacity, creativity, and critical thinking. While students need to possess core knowledge and skills, they must be adroit with technology and prepared for the demands of the Innovation Age.

How about user interface design of digital textbooks? According to Oviatt (2016, p. 19), computer input capabilities, like a keyboard or pen, substantially influence basic cognitive abilities, including the ability to produce appropriate ideas, solve problems correctly, and make accurate interfaces about information. If it is used for developing representations, modalities, and linguistic codes, this can stimulate human though and performance. This and other facts indicate that instructional designers should be focused not on how to use scanned or digitalised content for learning, but also how to develop critical thinking for sustainable development both of students and of environment, where they live. Thus, drill and practice or multimedia programs are long and bored for the actual students instead of, for example, voice-controlled technology.

There are plenty of ways to incorporate technology into teaching, learning and assessment of actual students. One of this is 'instructional scaffolding', designed to promote a deeper learning, when 'the learning process is tailored to the needs of the student with the intention of helping the student achieve his/her learning goals' (Sawyer 2006). For the instructional scaffolding is important to bring students in an ergonomic digital learning environment; to explain students ergonomics norms; to help students develop specific strategies for listening and/watching information on digital screen; to set specific listening and/watching tasks, emplacing key words; to limit the time for teacher talk, excluding repeating and paraphrasing the student's words.

Today's students have unlimited access to data, information and knowledge. They already live in a highly technological world and to a sustainable development, they should have the generative form of own competence, including relevant knowledge, as well as *skills* to observe, to plan and to prioritize etc. and *attitudes* expressed in capacity to communicate and to network for sustainable development. Thus, thinking and wisdom, in the Prensky's words, is a symbiosis of the human brain, challenges and environment.

One more issue has important on this way should be understood. Since digital textbooks are globally and/or locally developed, the *learning object* for understanding is more important than even. Conversely, when the students have freedom to use open textbooks, this may cause a controversy in provided content and availability of content for learning. The chapter will summarise the impact of digital revolution on literacy through analysing the features of learning society, differences between open educational systems and closed pedagogical systems, terminology of digital textbooks and the issues related no correlation between the digitalisation of didactic triangle and the new meaning of literacy.

## 3.5  Reflecting on User Interface Design, Learning and ADD/ADHD

Many of the actual students have diagnosed with Attention Deficit Disorder (ADD) and Attention Deficit Hyperactivity Disorder (ADHD). 'Attention-deficit/ hyperactivity disorder (ADHD) or hyperkinetic disorder (HKD) is a common neurodevelopment disorder characterized by developmentally inappropriate levels of inattentive and/or hyperactive-impulsive symptoms that are manifested in multiple setting. <…>. ADHD is associated with impairment in social, academic, and occupational functioning, leading to adverse consequences for affecting individuals, their family and society at large' (Chen 2016). The problem is that the number of children diagnosed with ADD and ADHD are staggering and continue to increase. However, according to Nexus magazine, there are not organic or physiological findings to substantiate the existence of any 'diseases'. Children have diagnosed with ADD when he/she stand when told to sit, fidgeting, and not being happy about doing chores or homework.

The most replicated factors point to define ADD/ADHD are deficits in working memory, response inhibition, vigilance and, planning as well ad time variability, language and speech, and motor control. The full range of ADD/ADHD symptoms may be influences by genetic factors and non-genetic factors. There are no confirmation regarding the correlation between using digital screen for learning and ADD/ADHD symptoms. However, in some cases ADD/ADHD has been associated with overweight and obesity because these children tend to spend more time in watching screen and less time in physical activities.

To avoid increasing ADD/ADHD issues children are treated with stimulant drugs. Pharmacotherapy remains a cornerstone of complex treatment. The most used are Ritalin (methylphenidata and dexamphetamine). But, stimulant drugs pose a long-term risk, could affect the processes of growth and development of child as a social individuum and, the most important thing, may led to depression or other serious diseases. Thus, even these children become more docile and get into 'less trouble', they are not stimulated to learn how to learn. For pedagogy, the scientific knowledge of ADD/ADHD treatment can be view as a body of a complex hypothesis that will lead to a new design approach for learning process.

Indeed, the attention disorder is a big issue of education in a Digital World. In the Ph.D. thesis, Chen (2016) wrote that ADHD is a highly prevalent and clinically heterogeneous neurodevelopment disorder affecting approximatively 3.4–7.3 % children and adolescents and 2.5–3.4 % adults worldwide. It was emphasis the needs to investigate the impact of generic and environmental factors that may lead to these disorders.

Montagni et al. investigated the association of screen time and ADHD. These authors prove well-known facts that students spend increasingly more time watching a screen on TV or on digital devices, including surfing the Internet. Excessive exposure to screen time is associated with unfavourable and unhealthy lifestyle habits, firstly because of low levels of physical activity. However, as for mental health, pathologically excessive screen time exposure may lead to substantial consequences, like a risk marker for anxiety, depression, suicide ideation, which can result in *addictive behaviour*. In plus, increasing levels of screen time exposure is associated with risk of self-perceived attention problems and hyperactivity levels.

In turn, many of the actual students have issues related with the span attention, memory and thinking (Visser 2014; Koenig et al. 2016). Visser (2014) has indicated toward a *temporal attention span*, as the ability to rapidly and accurately process sequences of consecutive target items, which may be limited. Koenig et al. 2016) noted that *selective visual attention* is the property of visual systems to elicit a behavior while at the same **time** equally salient stimuli in other parts do not with a visual stimulus at a particular location of the visual field. These and other studies have indicated *to the issue of investigation the conditions of the learning environments in which students will better focus the visual attention for learning, in particular involving the attention span*.

The memory span and the thinking span is other two issues related on how actual students learn. These issues must be investigated from the interdisciplinary points of view, to understand the real problems of learning actual students and to help them for better educational outcomes. The research questions are: (1) What are the interdependencies between user interface design and educational outcomes? (2) What techniques, methods or strategies are better to span attention, memory and thinking?

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