Green Paper: Digital Literacy

21st Century Competencies for Our Age: The Digital Age

The Fundamental Building Blocks of Digital Literacy
From Enhancement to Transformation

Department of eLearning

Contents

Purpose

The purpose of this document is to raise awareness of the importance of digital literacy within the education framework in Malta.

Objective

The purpose of the eLearning Department (eLD) within the Directorate for Quality and Standards in Education (DQSE) in the Ministry for Education and Employment (MEDE) is to help educators make the shift from traditional teaching and a traditional pedagogical approach to a 21st century learning environment. Our objective is to support and guide each teacher to make that shift. This setting is embedded in an interconnected and technology-driven world which has widened the learning place to the virtual, online, remote and anytime conditions. The eLearning Department is committed to progressively show what this environment looks like and how schools can teach 21st century skills as processes.

The eLearning Department in collaboration with the Curriculum Department within DQSE aims to shape the pedagogy since we touch literacies which have mainly been brought about through the digital environment. If a simple, starting definition of digital literacy had to be inserted at this point it would be:

> "Digital literacy is literacy via technology."

However things are not that simple since technology is continuously changing the environment we grew up in.

The eLearning Department believes that changing the way we teach and understanding how we learn in a technology driven world requires a different mind set, in and beyond the classroom. Thus the first step is to help all educators to accept that there is a need for change because the world has changed drastically and is continuously changing at an alarming rate. The second step is to continue to help educators understand that technology can help them achieve easily the heights that are unreachable without digital tools. In practical terms this boils down to tackling literacy beyond the 3Rs and we as educators start encompassing the 6Cs or 21st century competencies: **collaboration, communication, critical thinking, creativity, citizenship and character education**.

This statement is written for all levels from Kindergarten to Year 12 teachers and education leaders. So that everyone understands what that shift has to be. The 21st century competencies are skills, knowledge and attitudes that everyone needs in life beyond school. We all need these competencies and so it is important that everyone in education starts developing them.

As we make our way into the second decade of the 21st century, our society is increasingly joining and growing in the digital culture. Our students who are born into this culture are entitled to understand and profit from this environment which is new to us born in the 20th century. They are entitled to be digitally literate.

> "Digital Competence is both a requirement and a right of citizens, if they are to be functional in today's society."
> (Ferrari, 2012)

This entitlement or right puts upon us educators the responsibility to nurture and develop a number of competencies in our students so that they can take part in the social, cultural, economic and intellectual life. Thus becoming active citizens.

It has been said that "getting information off the Internet is like taking a drink from a fire hydrant," (Mitchell Kapor). With the Internet approaching 1 trillion pages, that statement has never been truer. Every day, every minute, more information is added to the Internet, with no sign of slowing down. Being digitally literate means being able to sift through so much information, being able to understand a message and to communicate it effectively to others in different formats. It means creating, collaborating, communicating, working ethically and understanding when, if and how technology should be used to reach efficiently an objective. So digital literacy involves the critical use of technology. It involves the awareness of and critical analysis of agendas and possible dangers with which technology bombards our daily lives. It involves educating our students to move from a passive consumer of information to an active producer both as an individual and as part of a community.

Towards Transformation

In 2001, Marc Prensky coined the terms "digital natives" and "digital migrants" to describe the behavioural differences between Baby Boomers and Generation Z (baby boomers describes the cohort of babies born from the end of WWII all the way up to the early 1960s while Gen Z are the group born since just before the start of the Millennium). Prensky argues that those who have grown with ubiquitous access to digital technology think differently to previous generations whose introduction to technology came later on in life. Although the terms have been challenged by many academics, there is much resonance in Prensky's assertion that teaching young people represents a significant challenge for educators, associating digital natives with: speed, multi-tasking, and a preference for graphics over text, random access, social networking, instant gratification, frequent rewards, and games over work.

Today's generation appears to engage with all things that are digital without any effort at all. Young people are born into an interactive, on demand digital culture where they are used to texting, video streaming, mobile Internet and social networking to mention just a few. However, this description which may have implanted itself in some of us who have not realised that this is a dead metaphor in that it veils and conceals a potential problem. It is true that most of our young people do not need to be persuaded to use technology, and the time they spend glued to what they love doing most quickly improves their skills. But the tricky question is "which skills"?

Research indicates that learners do not really know how to capitalise on technology (Poore, 2011; Mueller et al., 2014). Learners need to acquire digital literacy skills as without any form of formal guidance they are likely to remain uninformed and uncritical users of ICT. A couple of visits to Ask.fm is enough to raise concerns about a generation that is not fully digitally literate, yet deeply immersed in cyberspace.

In order to be literate in today's media-rich environments, young people need to develop knowledge, values and a whole range of critical thinking,

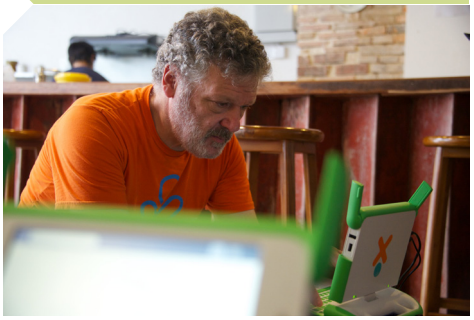
communication and information management skills and competencies for the digital age. If our young generation - indeed all citizens - lack digital competencies, they risk being disenfranchised when it comes to government services, employment opportunities and democratic participation.

What is Digital Literacy?

It is important to put the concept of digital literacy in a historical context. It starts with the term literacy which 3000 years ago meant being an effective public speaker; being able to use the rhetorical tools of persuasion. So literacy in its fundamental sense is the sharing of meaning through language. With Guttenberg, literacy was redefined to include reading and writing. The portable camera brought about the ease of producing and distributing images - so educators introduced the concept of *visual literacy*, highlighting the importance of how to look at images, and understand the way images communicate and carry meaning. The emergence of databases introduced a new wave of powerful technologies to shape shape literacy. These technologies needed a new set of skills, competencies and strategies for searching, finding and evaluating information - creating *information literacy*. *Media literacy* followed shortly with hundreds of TV channels to choose from. The microprocessor on our desks created the need for an ICT-literate generation and a entirely new set of technical skills to maximise the potential of the technology.

And digital literacy? This is the emerging concept which in some sectors became a contested idea. However, since the seminal work of Paul Gilster, *Definitions of Digital Literacy*, there has been a growing consensus about the term digital literacy.

Are you literate?



What does it mean to be literate today? It is an appreciation of various contexts. In traditional literacy everything was straight forward where the author was very clear and explicit. Today we face a situation where we continually face a juxtaposition of various cultures based not only on geographic distances but also on psychological, political and experiential differences. So it is a much more complex endeavour to understand what literacy is.

Twenty years ago being literate meant being able to read and write. Richard Lanham (1995, p. 198) claims that "literacy" has extended its reach from meaning "the ability to read and write" to now meaning "the ability to understand information however presented." We are not just preparing students for today with this new meaning of literacy in mind but also for the future with a shift from consumption to production. The Internet, the World Wide Web, smartphones, Facebook are very recent terms when compared to what has been going on in schools these past 20 years. We are not just consuming what is happening on the web and digital spaces but we are also producing, which requires a sharper level of complexity. So literacy today means much more than the reading of text, which is its original meaning. If you could write your name and you could consume, read directions and read books, you could make sense of the world. But today the production part is as important if not more, than the consumption part. Reading is changing as well. Online reading is different from reading from a book, but the material that we are reading is also

changing. The infusion of the visual into texts gives a new dimension to literacy. Literacy needs to encompass understanding and interpretation of the visual symbols of all kinds and images.

Definitions

Digital Literacy is a contentious term and there is not much a sense of agreement on what we mean by digital literacy. Here is the Royal Society for DL in the "Shut down or restart" report which came out in January 2012.

> "Digital literacy should be understood to mean the basic skill or ability to use a computer confidently, safely and effectively, including: the ability to use office software such as word processors, email and presentation software, the ability to create and edit images, audio and video, and the ability to use a web browser and Internet search engines. These are the skills that teachers of other subjects at secondary school should be able to assume that their pupils have, as an analogue of being able to read and write."
> (Royal Society, 2012)

They say that digital literacy is really about basic computer skills, the ECDL type of syllabus, the ability to use standard Office packages, to be able to use the Internet, and the sort of thing that any secondary school teacher ought to assume that any child in their class is capable of doing. Thus by implication most of the children in year six and a good proportion of those in year five ought to be able to do as much of this staff is skills based or functional skills based approach.

There is not much agreement around this definition although you might think that it is a perfectly sensible and valid one. This definition is akin to saying that literacy is merely the ability to read and write and that of course is a part of literacy but our understanding of literacy is much more. It is about the understanding of meaning and the conveyance of meaning rather than simply reading and writing skill on their own.

> "Digital literacy refers to the more subtle and situated practices associated with being able to create, understand and communicate meaning and knowledge in a world in which these processes are increasingly mediated via digital technologies."
> (Futurelab, 2010)

Futurelab have a more subtle and situated understanding of digital literacy about communicating their meaning. It is largely about understanding and conveying meaning just like literacy but this time mediated through a digital domain.

> "Digital literacy provides a critical understanding of technology's impact on society and the individual, including privacy, responsible use, legal and ethical issues."
> (British Computer Society/ Royal Academy of Engineering, 2012)

The British Computer Society took a slightly different tack to how digital was to be understood. Much more about the implications of technology for an individual's life in society. They argue that word critical is extremely important and that it is not just accepting these things but the user must

have an understanding of how a document has been made. Finding things on the Internet matters but an awareness of how a search engine like Google puts those results into order and where is Google's business model is an understanding of the back story to some of those results is part of what we want an understanding of technology's impact to involve.

The Australian Communications and Media Authority (ACMA) points out that there are many varied definitions of Digital literacy and gives examples that they adopted:

> "1 the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers (Gilster);
> 2 the skills, knowledge and understanding that allow consumers to use media effectively and safely (European Commission); and
> 3 the ability to use, understand and create media and communications (Ofcom, 2009)."
> ACMA (2009)

Owing to the Singaporean students' high performances in the Programme for International Student Assessment (PISA), this country is often scrutinised for the elusive golden answer to what constitutes the best teaching and learning. In Singapore digital literacy is understood as digital curricular literacies and is used to contextualise ICT in the classroom. The work described in the digital curricular literacies and project-work tends to be on the level of substitution and augmentation as described in the SAMR model by Puentedura.

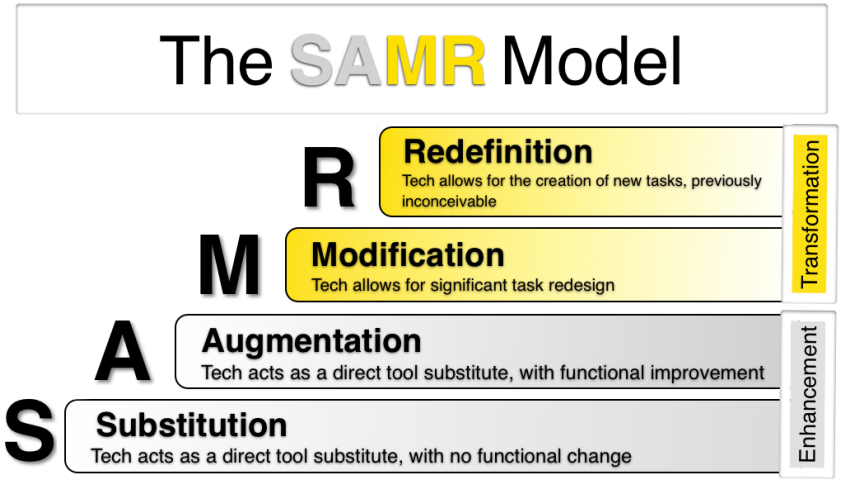


Image by Dr. Ruben Puentedura http://www.hippasus.com/rrpweblog/

The SAMR model by Ruben R. Puentedura is more about mindset than technical competence. This model is likened to a "swimming pool" where teaching and learning with technology happens. One starts at the shallow end with a comfortable wade before stepping out of the comfort zone and venture into the deep part.

The UK government gives a basic skills definition of digital literacy in the Race Online 2012 manifesto, and equates using a computer connected to the Internet with digital literacy:

> "Digital literacy is a great enabler of social mobility. It is a way for

> those who have had bad experiences of institutions to re-engage in learning. And it can break down feelings of social isolation. It is a powerful weapon to fight against poverty."
> (Race Online, 2012)

It is interesting to note that there is no reference to a critical element.

During its four year programme running from 2004 to 2008, Norway made digital literacy the fifth basic competence along with the 3Rs and oral skills. The Norwegian curriculum framework define digital literacy as:

> "the sum of simple ICT skills… and more advanced skills that makes creative and critical use of digital tools and media possible."
> (Cited in Erstad, 2007)

This fifth competence is seen as the ability to make use of ICT and constitutes a basic skill. Contrary to the UK definition, the Norwegian Ministry of Modernisation (2005) emphasises the critical element in its definition of digital literacy:

> "Digital skills include the ability to exploit the opportunities offered by ICT, and use them critically and innovatively in education and work. Digital skills also include the ability to be critical to sources and assess content. Use of digital tools is a skill the individual must acquire, maintain and continually develop, if he or she is to be a digitally skilled and critical citizen."

European Commision

Despite the ambiguous terms, the European commission, which represents the general interests of the European Union (EU), has funded work on the concepts of e-competencies (http://www.ecompetences.eu/) and digital competencies (https://ec.europa.eu/jrc/sites/default/files/lb-na-26035-enn.pdf). Further more, in response to a call for actions on "digital literacy", one of four key strands in the context of the eLearning Programme of the European Commission, the DigEuLit project was proposed. The DigEuLit project declared that the ability to use ICT and the Internet has become a new form of literacy – "digital literacy". They said that Digital literacy has become a prerequisite for creativity, innovation and entrepreneurship and without it citizens can neither participate fully in society nor acquire the skills and knowledge necessary to live in the 21st century. (European Commission, 2003: 3)

In another European Commission working paper (European Commission, 2008) digital literacy is defined as:

> "the skills required to achieve digital competence. It is underpinned by basic skills in ICT and the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet".

The definition indicates that digital literacy is comprised of basic ICT skills, which lead to digital competence. However, in the academic field, digital literacy is used as a synonym for digital competence.

Further research carried out by European academics operating within the wider international sphere, talks of how technology affects our daily lives and says that:

> "To participate and take advantage, citizens must be digitally literate - equipped with the skills to benefit from and participate in the Information Society. This includes both the ability to use new ICT tools and the media literacy skills to handle the flood of images, text and audiovisual content that constantly pour across the global networks." (Europe's Information Society Thematic Portal, 2007)

It is evident from the above definition that digital literacy and ICT literacy are considered to be one and the same thing. The text goes on to explain how digital literacy is part of the EC i2010.

The Director General Enterprise and Industry (e-skills/index_en.htm) uses the term eskills and focuses on skills at the workplace while differentiating among three groups of users:

1. the ICT practitioner;
2. ICT user;
3. eBusiness or eLeadership.

One of the outcomes of this policy is the reference framework for ICT practitioners already mentioned above: eCompetence.

Digital skills and competences were approached from a lifelong perspective by the European Parliament based on the Communication of the Director General for Education and Culture and defined Digital Competence as one of the 8 Key Competences:

The definition from the 2006 document states:

> "Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet."

The document continues to describe the essential knowledge, skills and attitudes required to be deemed digitally competent.

In order to create a consensus at the European level about the components of Digital Competence, the DG Education and Culture launched a study with the aim to contribute to a better understanding of digital competence and to develop a Digital Competence framework in Europe.

The Digital Competence framework consists of five areas and 21 competences. Competences are detailed in three proficiency levels. The framework is presented in a tabular form. It is a matrix which consists of different dimensions and that can be presented in several ways. In the original framework (Ferrari, 2013), for every competence there are

examples of knowledge, skills and attitudes and also examples on how the competence can be applied for two different purposes (namely: learning and employment).

Five areas of digital competence were identified and can be summarised as follows:

1. Information: to identify, to locate, to retrieve, to store, to organise and analyse digital information, judging its relevance and purpose.

2. Communication: to communicate in digital environments, to share resources through online tools, to link with others and to collaborate through digital tools, to interact with and to participate in communities and networks, cross-cultural awareness.

3. Content-creation: to create and edit new content (from word processing to images and video); to integrate and re-elaborate previous knowledge and content; to produce creative expressions, media outputs and programming; to deal with and apply intellectual property rights and licences.

4. Safety: personal protection, data protection, digital identity protection, security measures, safe and sustainable use.

5. Problem-solving: to identify digital needs and resources, to make informed decisions on most appropriate digital tools according to the purpose or need, to solve conceptual problems through digital means, to creatively use technologies, to solve technical problems, to update own and other's competence.

From the small sample of international definitions it is immediately apparent that there is considerable discussion, much in common but at the same time differences in interpretation and representation. Common grounds acknowledge that digital literacy includes, but goes beyond, simple technological skills. Thus digital literacy includes the more complex skills of understanding and analysis which lead to deciding and selecting the proper digital tools, be they software or hardware, to create a variety of content.

> "Having the knowledge and ability to effectively and critically navigate, evaluate and create information using a range of digital technologies. A digitally literate person can use technology strategically to find and evaluate information, connect and collaborate with others, produce and share original content, and use the Internet and technology tools to achieve many academic, professional and personal goals." From National Lifelong Learning Strategy 2020 (Alex Grech, 2014)

It is evident from the above definition that digital literacy requires various abilities and aptitudes. It entails not just technological skills but also reflective, social and ethical practices.

Technology in the Classroom?

Every piece of technology, whether it is a mobile phone, a PC, tablet or a pencil needs to have its academic potential considered. While mobile phones are currently a banned device in our schools, it is not just the mobile phone. It could be any digital device and for that matter it could also be a textbook, a pencil, a rubber or a ruler, if the student is not on task. Thus it is important to us to make a shift to a learning environment in which we challenge our students to communicate their understanding of the curricular objectives or learning outcomes that we are looking for in what ever way speaks to them. So for some students that may be using pen and paper, for some students that may be producing a video while for others it may be creating a presentation. It should be up to the students to determine the best way for them to communicate. Whatever technology you have in the classroom is alright but the real question is, "Are you on task with that?" Whether you are on task with a pencil or on task with a mobile digital device the question is the same.

Differences Hardware vs Headware

I want to make a very important distinction because many people think that when we start talking about 21st century learning and education we are talking about technology. We are not. When we talk about problem solving (which is solution fluency), critical thinking (information fluency), communication, collaboration, creativity or any of the other competencies we are talking about the cognitive and not about the hardware. These 21st century competencies have been nicknamed by some as headware competences and are different from hardware skills. None of the 21st century competencies are computer skills but they are thinking skills. It is not about teaching a PowerPoint but about teaching how to communicate. The technology can be an engaging and interesting part of the environment but the goal is certainly not to teach technology. The goal is to teach how to think or headware competencies which is applicable across every year and every subject and is not directly related to the amount of technology that we have in schools. As I said earlier, the tools only help us reach easily what is unreachable without technology.

What's in a name?

Digital literacy can be approached from at least two different standpoints: one is from a conceptual point of view and the other is from an operational standpoint; each comes with its own definitions. Eshet-Alkalai quoted by Bawden (2008) says that there are those who see digital literacy primarily concerned with technical skills and those who see it as focused on cognitive and socio-emotional aspects of working in a digital environment. While the technical aspect must not be ignored, it should be considered as only a small part of a number of building blocks but certainly not the focus of attention. This document takes the stand claimed by Gilster (1997), Pool (1997), and Lankshear and Knobel (2011) that digital literacy involves "mastering ideas, not keystrokes." It is important to emphasize the plurality of digital literacies because of the sheer diversity of specific accounts of digital literacy that exist. The document will continue to talk about digital literacy, and retains the term used in the National Curriculum Framework (NCF) but is to be understood as digital literacies – in the plural.

Is Digital Literacy important?

This question has a simple answer: Yes it is important. Technology has been part of our lives since fire was discovered and digital technologies are our tools today whether we like it or not. It is there, will continue to evolve and it is not going to go away. Our children are using these tools and there is no going back to the gramophone. On the other hand we cannot accept the idea that because children can use a computer or any other digital gadget, they know how to use it safely, wisely and productively. It is the teacher's role to make that happen in the same way that we teach them how to be safe on the road and in the house.

Mark Surman, Executive Director of the Mozilla Foundation, in an interview for the a November 2013 editorial in The Telegraph said that digital literacy is as important as reading, writing, arithmetic and other traditional disciplines.

> "Becoming literate in how the technical world works is equivalent to reading, writing and maths. We need to look at this fourth literacy as mainstream."

http://www.telegraph.co.uk/education/educationopinion/10436444/Digital-literacy-as-important-as-reading-and-writing.html

Every educator must understand that digital literacy is essential if we want our citizens to function in today's modern world. We know that the world is a different place than it was ten years ago. In 2007 the first smart phone was introduced and a new career of app developer was born. How did these first developers get there when there was no prescribed path for them to take? We can list numerous new careers that did not exist ten years ago. A key ingredient in these new jobs is that they require people who are digitally literate. In developed countries, 4 out of the 7 fastest growing jobs directly require technology skills (2 of them being in software development).

http://www.usatoday.com/story/money/personalfinance/2013/12/08/7-fastest-growing-jobs-in-america/3891571/ (Horizon 2020)

Why is Digital Literacy important?

Preparing our students for today's modern world and whatever the future will bring with it is at the core of the National Curriculum Framework. Digital literacy is envisaged as a transversal skill across the traditional subjects. Together with the traditional literacy skills of numeracy, listening, speaking, reading and writing, whose main objective is to develop active thinkers who can engage in society in effective and meaningful ways, the digital society requires a larger set of competencies (Combes, 2010).

At different stages of their time spent in school, students will be expected to create audio recordings, add visual elements to clarify ideas, thoughts and feelings, and to use technology to interact and collaborate with each other. They will also be expected to collaborate on, produce, peer-edit and publish their writing online. They will be taught how to select their own tools to interact on a wide variety of projects and content areas.

Digital literacy is not a luxury that can wait.

"We know that the nature of literacy has changed in the digital age, but unfortunately, we do not have decades to catch up to this change."
(Hicks and Turner, 2013)

Digital literacy model

If our children do not learn how to learn, how to be flexible and adaptive and find communities and have ideas on what they want to do now, then we are failing them as educators. We have to educate everyone to be creative and think about things. We cannot afford anymore to educate a segment of the community. We need to think about how we think learning happens, where it happens and who is capable of learning.

The foundation building blocks for digital literacy are the infrastructure and the access to the tools. Infrastructure in schools and beyond has been improving steadily. However investment in infrastructure alone does not bring about the changes promised by ICT. It is only when we change our mindsets to use them reflectively and strategically, that teaching and learning processes can be deepened. So investment in training on how to use ICT, and working towards a vision of transformation, creative thinking and innovation becomes the focus of what needs to be done. The first steps to take in the journey towards transformation in the way we teach and learn is to understand the foundation blocks of digital literacy.

The building blocks

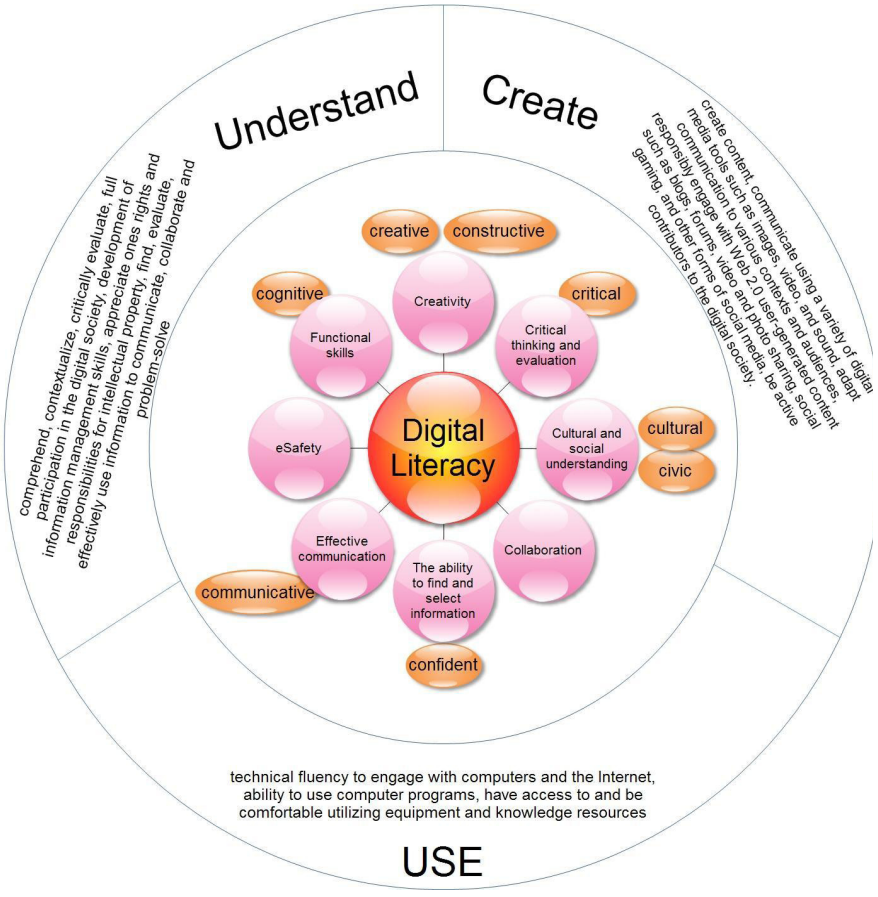


Figure 1 Adapted from Belshaw (2011), Digital Canada 150, Futurelab and European framework for Digital Literacy.

Henry Jenkins (2006) identified a series of new literacies that are needed to be literate in the 21st century. Among these are simulation, visualisation, collective intelligence and distributed cognition. Figure 1 is based on models described by various researchers in the field of digital literacy and shows how digital literacy incorporates numerous interrelated skills that range from basic awareness to more complex creative and critical literacy and outcomes. The model in figure 1 follows a sequential process as much depends on the needs of individual users.

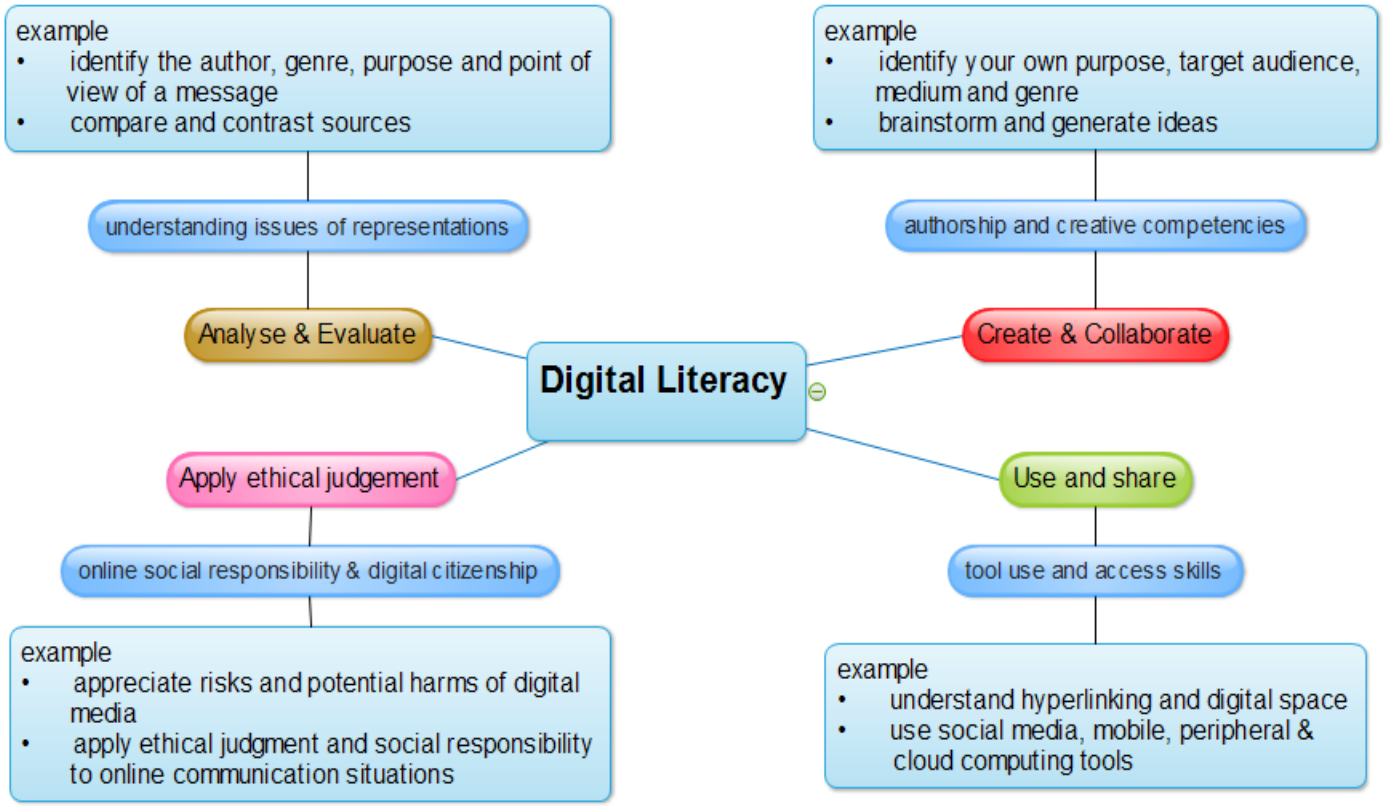


Figure 2 Adapted from Hobbs (2010)

Renee Hobbs describes another model for digital literacy (figure 2) and in her research, published in 2010, she offers a plan of actions to bring a number of competencies in focus. In her report, she defines digital literacy as a constellation of life skills that are necessary for full participation in a media-saturated, information-rich society. These include the ability to:

1. **use and share**; (tool use and access skills) Create content in a variety of forms, making use of language, images, sound, and new digital tools and technologies
2. **create and collaborate**; (authorship and creative competencies) Take social action by working individually and collaboratively to share knowledge and solve problems in the family, workplace and community, and by participating as a member of a community
3. **analyse and evaluate;** (understanding issues of representations) Analyze messages in a variety of forms by identifying the author, purpose and point of view, and evaluating the quality and credibility of the content
4. **apply ethical judgment;** (online social responsibility & digital citizenship) Make responsible choices and access information by

locating and sharing materials and comprehending information and ideas. Reflect on one's own conduct and communication behaviour by applying social responsibility and ethical principles

Concepts

The 21st century competencies are the core competencies that are essential for life in our century. So what are the competencies that students need to be successful in life beyond the school? They need problem solving; they need creativity; they need critical and analytical thinking, communication and collaboration skills. To which we need to add the areas of ethics, actions and accountability where people learn how to take responsibility for their personal health and well-being, learn who they are and their identity in the world and global citizenship and environmental responsibilities. All of these come into this category. The thing is that we do not do anything or are not doing enough to tackle the issue of problem solving in class. We do identify this need as educators and say that students need problem solving skills but usually that is where it all ends. We do not talk about how to do that. 21st century competencies have to be broken down into processes that can be taught, remembered and duplicated. So in **problem solving** we start with **defining** the problem, moving to **discovery** which determines how the problem arose, **dreaming** or looking at the solution in the future, **design** which is mapping out the process for how the problem will be solved, **delivering** that is actually doing the solution and **debriefing** which is going back and asking how the product or the process can be made better this time or the next time. This is a structured process of problem solving. The interesting thing is that recent research indicates that if you teach a child a structured problem solving process by the age of twelve they would instantly have a 10 percentage point increase in their tests and more importantly that it will be sustained through out their life, strictly by teaching them a structured problem solving process. So the competencies can all be broken down into processes and there are steps in how we can do this whether it is creativity, communication, collaboration or critical thinking.

Implementing into curriculum

We are talking about the essential skills that students need for their life beyond school. Who should take responsibility for that? It is every single teacher at every year in every subject should take responsibility for that because these are the basic competencies that our children require to be successful in life. Therefore everyone should be doing this. That being said, in the structure of the 21st century literacy fluency and the structure we do with literacy is not enough. It is designed to function within individual class. Now it is impossible to contain it within an individual class because automatically you would be including curricular objectives or learning outcomes from all the disciplines and it is difficult in a process based learning environment to keep these projects contained within the walls of one subject. This is the natural way of learning. If you think how we deal with learning in primary school or junior school we teach kids and we follow the interest of kids. It is cross-curricular; it is multi-disciplinary. But as we move to secondary school we start teaching subjects instead of teaching students. So we make the switch valuing the content over the individual. If we took all those philosophies used in primary schools and put them in the secondary school we would have a very interesting place. This is essentially what 21st century learning is like. It is discovery based

learning where students use higher order level thinking to create digital products that are real world solutions to real world problems.

Teaching learning vs teaching content

There is a significant difference between teaching learning and teaching content. Often in schools the focus is on content not on competency, not on skills not on abilities and that is because it is easy to measure that stuff. It is very easy to say does this person know this fact yes or no. It is easy to assess. That is why standardised testing is so popular. It is very easy to test low-level factual recall. The thing is that when we look at the national standards in whatever country that you are in, those should be considered the minimum things that we are trying to accomplish in education. That should not be the goal but a starting point. We need to be focusing on something more. The thing is that in the 21st century learning environment when we teach process and we learn content through that process, when the content fades, the processes still remain. The problem solving skills will still be there. The content may be forgotten but the process will always be there and that is what we should be aiming to achieve. So it does not matter what curricular outcomes, what learning outcomes, what objectives, what standards, these make no difference because they are just the vehicle in which the competencies are presented.

Teacher challenges

Teaching in the 21st century is a major challenge to us teachers because most of us have been in a classroom since the age of at least five. So by the time teachers start teaching, they would have already had at least 16 years in a classroom either as a student or as a student teacher and because of this we have a very particular notion of what teaching and assessment look like. It is largely focused around control: controlling the situation, controlling the flow of information, controlling the environment, controlling the outcomes. Making a shift to a 21st century learning environment is an uncomfortable place for teachers at first because it is chaotic and dynamic because everything changes all the time. When teachers pose questions and they do not know the outcomes it's an uncomfortable place for teachers. When teachers start to embrace saying, "I do not know," and even if they do know saying, "I do not know," because that is what is in the best interest of the student: the student discovering their learning, teaching finally becomes a much easier place to teach from. Teaching becomes more a process about guiding the process as opposed to leading the process. When we remove the burden for responsibility of the learning from the teacher where it has been to the student where it should be, it becomes an uncomfortable process for the teacher but it is a very rewarding one as experienced by thousands of teachers world wide who would never go back to traditional teaching.

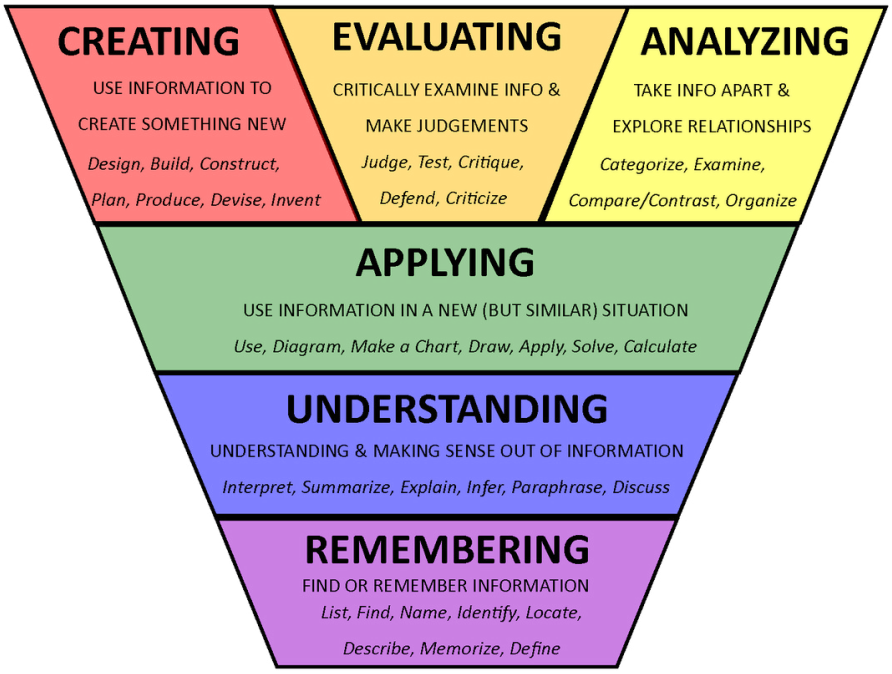
Long term goals

We need to commit ourselves to change education at classroom level. We will change the world by changing education at classroom level. If we can get one teacher at a time to make the shift to 21st century learning, how many children would they impact in their lifetime?

Disconnected?

There is a significant disconnection between school and the real world and it is a gap that is widening daily. So what are the critical skills that students need to be successful in the 21st century? The answers may be categorised into six areas:

1. Students need to be able to solve complex problems in real time (Problem solving – solution fluency);
2. Students need to be able to think differently and creatively in both digital and non digital environments to create new and useful solutions (creativity – creativity fluency);
3. Students need to think analytically; comparing, contrasting, evaluating, synthesising in the higher end of Bloom's Digital Taxonomy. (critical thinking – information fluency);
4. Students must have the ability to collaborate seamlessly in both the physical and virtual spaces with both real and virtual partners. (collaboration / collaboration fluency);
5. Students must be able to communicate but not just with text or speech but in multiple multi-media formats. (communication – media fluency);
6. Students need to act ethically taking personal responsibility, take calculated risks, being resilient, having a global perspective, understanding other cultures, traditions, customs and religions. This category also includes environmental stewardship and acting altruistically. (actions, ethics and accountability).



One of many representations of Bloom's taxonomy in the cognitive domain.

Go and be creative!

What do these competencies look like? How do we do that? What is the process for problem solving? What is the process for creativity? We cannot just stand over students and tell them to be creative. We need to give them a skills set and a structured process that they can go through in order to cultivate creativity and the other competencies. Thus we need structured processes that can be thought in a structured manner at every age and every subject area. We need a common language that every

student, teacher and institution can share, to explain, to learn, to practise and to improve upon.

How do we get there?

How do we get there and how do we do this? Training must have an end objective in mind. It is not just saying here is how you use a few tools, or here is a new piece of software that you can use. We must focus on the end product. We need to look at what teaching learning and assessment will look like and that must be a 21st century learning environment which in three words is relevance, creating and real world.

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