

Digital Competence in the Knowledge Society

Eliana E. Gallardo-Echenique

Researcher

Faculty of Educational Sciences and Psychology
Universitat Rovira i Virgili
Carretera de Valls s/n, 43007, Tarragona, Spain
egallardoechenique@gmail.com

Janaina Minelli de Oliveira

Lecturer

Faculty of Educational Sciences and Psychology
Universitat Rovira i Virgili
Carretera de Valls s/n, 43007, Tarragona, Spain
janaina.oliveira@urv.cat

Luis Marqués-Molias

Dean

Faculty of Educational Sciences and Psychology
Universitat Rovira i Virgili
Carretera de Valls s/n, 43007, Tarragona, Spain
luis.marques@urv.cat

Francesc Esteve-Mon

Lecturer

Faculty of Educational Sciences and Psychology
Universitat Rovira i Virgili
Carretera de Valls s/n, 43007, Tarragona, Spain
francescmarc.esteve@urv.cat

Abstract

New Information and Communication Technologies such as the Internet, online gaming worlds, artificial intelligence, robotics and 3D printing require new literacies. In recent years, digital competence has become a key concept in discussions on the kind of skills and understanding learners need in the Knowledge Society. The concept has been interpreted in various ways (e.g. Digital Literacy, Digital Competence, eLiteracy, e-Skills, eCompetence, Computer literacy, and Media literacy) in policy documents, in the academic literature, and in teaching, learning and certification practices. In this paper we review the literature on digital competence and related terms. This review of 73 articles published between 1990 and 2014 shows that digital competence is a multi-faceted concept that has emerged from several backgrounds. Not yet a stable concept, there are still no clear guidelines for evaluating it. While some perceive digital competence as the technical use of ICT, others define it more broadly as knowledge application or 21st century skills.

Keywords: digital literacy, digital competence, multiliteracies, literature review, integrative review

Introduction

The word “literate” means to be “familiar with literature” or “well educated, learned” (UNESCO, 2006, p. 148). The term “literacy” is an evolving concept derived from conceptions of traditional (print) literacy and related literate practices (UNESCO, 2006; Area, Gutiérrez & Vidal, 2012). Since the late nineteenth century, it has also referred to the ability to read and write text using traditional (print) literacy (Belshaw, 2011; UNESCO, 2006). Today, this meaning has been

extended to include practices mediated by new technologies – particularly computing and communications technologies (Belshaw, 2011).

The educational landscape is changing rapidly (Kress, 2003). The Internet has a multiplicative effect that enables the dissemination and generation of new technologies with educational, social, and cultural consequences. New digital technologies, for example, can integrate sound and moving images, oral and written language, and 3D objects, etc. Used in educational contexts, each of these digital devices has specific affordances, uses, and constraints. New information and communication technologies therefore require new literacies (Leu, Zawilinski, Castek, Banerjee, Housand, Liu & O’Neil, 2007).

In this new educational landscape, many learners enter further and higher education without the skills they need to apply digital technologies to education (European Commission, 2013). Extending and improving digital competence is an essential component in the development of employable graduates. Since 90% of new jobs will require excellent digital skills, those without sufficient ICT skills will be at a disadvantage in the labor market and have less access to information (European Commission, 2013; JISC, 2013).

In recent years, digital competence has become a key concept in discussions on the kind of skills and understanding learners need in the knowledge society. However, it has been interpreted in various ways (e.g. Digital Literacy, Digital Competence, eLiteracy, e-Skills, eCompetence, Computer literacy, and Media literacy) in policy documents, in the academic literature, and in teaching, learning and certification practices. All these terms highlight the need to handle technology in the digital age (Ferrari, 2012; Gallardo-Echenique, 2012). In this paper we analyze the range of concepts and approaches associated with digital competence and its related terms.

Digital competence has been analyzed from several linguistic, cultural and disciplinary backgrounds. This paper does not intend to reach a single definition in a reductionist view but to systematically review the various definitions and to identify the connection points from a broad and diverse vision. This will enable us not only to further advance the knowledge generation but also to identify key aspects of this essential competence for education in the 21st century.

Method

To address our research aim, we conducted an integrative literature review (Table 1) that: “reviews, critiques, and synthesizes representative literature on a topic in an integrated way such that new frameworks and perspectives on the topic are generated” (Torraco, 2005, p. 356). This method incorporates a wide range of empirical and research-based articles, books, and grey literature (e.g. conference website and published proceedings) on digital competence from databases such as the ISI Web of Knowledge, ERIC, the Social Sciences Citation Index®, ScienceDirect, SAGE Publications, Wiley Online Library, Taylor & Francis Online, Emerald Group Publishing, the European Union Database, the UNESDOC Database and Google Scholar.

Table 1.

Stages of the integrative review process

| Stage | Application |
|------------------------|---|
| Problem identification | Range of terms, concepts and approaches associated with digital competence and its affiliate terms |
| Literature search | Electronic databases searched Internet search strategy Search terms Inclusion/exclusion criteria |
| Data evaluation | Empirical and theoretical publications |
| Data analysis | Thematic analysis to develop categories |
| Presentation | Summary of major findings |

| | |
|--|-------------------------|
| | Limitation of the study |
|--|-------------------------|

The inclusion criteria were: a) peer-reviewed journal articles, b) reports commissioned by international organizations, and c) literature reviews, including unpublished/grey literature from government reports, policy statements, conference proceedings, theses, dissertations, and research reports. Only full-text articles published in English (universal language of science) or Spanish (reviewers' mother tongue) between January 1990 and December 2014 were included. Descriptors used to identify exemplars included Digital literacy, Digital competence, ICT literacy, Computer literacy, and Media literacy. A list of conceptually similar words is used throughout the literature.

Two Spanish/English-speaking researchers conducted the review of the articles. As the initial search with the keyword combinations yielded thousands of publications, a staged review – first an initial review and then an in-depth review of the abstracts (Torraco, 2005) – was conducted to review, identify relevant publications, and assign the category of “not for review” or “for review”. This search recorded a preliminary 682 publications. Inclusion and exclusion criteria were applied to the papers in the “for review” category during screening. In all, 73 articles (both qualitative and quantitative) met the inclusion criteria and matched the aims of this review. In the final stage of the review, a thematic analysis (Braun & Clarke, 2006) was conducted in order to create categories. The publications were synthesized and categorized according to specific literacies (media literacy, information literacy, computer literacy, ICT literacy, and technology literacy) associated with digital competence.

Digital competence: a review of terms, concepts and characteristics

Recent years have seen numerous important international contributions aimed at defining digital competence, which has become a key concept in discussions of the kind of skills and understanding people need in the digital era. Table 2 gives an overview of the wide range of terms used for this concept. As will be explained in greater detail, some are intrinsically associated to digital competence and some are slightly different.

Table 2.

Terms referring to digital competence

| Term | Reference | Year | Design | Type |
|----------------|---|------|-------------|--------------|
| Media literacy | Aufderheide & Firestone | 1993 | Theoretical | Report |
| | Bawden | 2001 | Theoretical | Journal |
| | Henry J. Kaiser Family Foundation | 2003 | Theoretical | Report |
| | New Media Consortium | 2005 | Theoretical | Report |
| | Pérez-Tornero & Varis | 2010 | Theoretical | Book |
| | Wilson, Grizzle, Tuazon, Akyempong & Cheung | 2011 | Theoretical | Report |
| New literacies | Buckingham | 1993 | Theoretical | Journal |
| | Leu | 2000 | Theoretical | Journal |
| | Lankshear & Knobel | 2003 | Theoretical | Book |
| | Leu et al. | 2007 | Theoretical | Book Chapter |
| | Coiro, Knobel, Lankshear & Leu | 2008 | Empirical | Book |
| Multimodality | Kress & Van Leeuwen | 1996 | Theoretical | Book |
| | Kress, Jewitt, Ogborn & Tsatsarelis | 2001 | Theoretical | Book |

| | | | | |
|----------------------|---|------|-------------|--------------|
| | Kress & Van Leeuwen | 2001 | Theoretical | Book |
| | Kress | 2003 | Theoretical | Book |
| | Jewitt & Kress | 2003 | Theoretical | Book |
| | Jewitt | 2008 | Theoretical | Journal |
| | Walsh | 2009 | Theoretical | Book Chapter |
| Computer literacy | Hawkins & Paris | 1997 | Empirical | Journal |
| | National Research Council | 1999 | Theoretical | Report |
| Digital literacy | Gilster | 1997 | Theoretical | Book |
| | Bawden | 2001 | Theoretical | Book Chapter |
| | Eshet | 2002 | Empirical | Conference |
| | Eshet-Alkalai | 2004 | Theoretical | Journal |
| | Pérez-Tornero | 2004 | Theoretical | Report |
| | Martin | 2005 | Empirical | Journal |
| | Jones-Kavalier & Flannigan | 2006 | Theoretical | Journal |
| | Martin & Grudziecki | 2006 | Empirical | Journal |
| | Buckingham | 2007 | Theoretical | Journal |
| | Somerville, Lampert, Dabbour, Harlan & Schader | 2007 | Theoretical | Journal |
| | Eshet-Alkalai | 2009 | Theoretical | Book Chapter |
| | Nawaz & Kundi | 2010 | Theoretical | Journal |
| | Area, Gutiérrez & Vidal | 2012 | Theoretical | Journal |
| | Meyers, Erickson & Small | 2013 | Theoretical | Journal |
| Media education | UNESCO | 1999 | Theoretical | Report |
| | Pérez-Tornero | 2004 | Theoretical | Report |
| | Hague & Williamson | 2009 | Theoretical | Report |
| Information literacy | Bawden | 2001 | Theoretical | Journal |
| | Association of College and Research Libraries | 2000 | Theoretical | Brochure |
| | Jackman & Jones | 2002 | Theoretical | Report |
| | Buschman | 2010 | Theoretical | Journal |
| | Wilson et al. | 2011 | Theoretical | Report |
| Multiliteracies | Cope & Kalantzis | 2000 | Theoretical | Book |
| | Unsworth | 2001 | Theoretical | Book |
| | Jewitt | 2008 | Theoretical | Journal |
| | Hepple, Sockhill, Tan & Alford | 2014 | Empirical | Journal |
| | Tan & Guo | 2014 | Empirical | Journal |
| ICT Literacy | International ICT Literacy Panel | 2002 | Theoretical | Report |
| | Somerville et al. | 2007 | Theoretical | Journal |

| | | | | |
|--------------------------------|---|------|-------------|--------------|
| eLiteracy | Martin | 2003 | Position | Journal |
| e-Competence | European eCompetence Initiative | 2004 | Theoretical | Project |
| | Schneckenberg & Wildt | 2006 | Theoretical | Book Chapter |
| | European e-Competence Framework | 2007 | Theoretical | Report |
| | Breyer, Hook & Marinoni | 2007 | Theoretical | Report |
| | European e-Competence Framework | 2010 | Theoretical | Report |
| e-Skills | European e-Skills Forum (European Commission) | 2004 | Theoretical | Report |
| | DG Enterprise and Industry (European Commission) | 2007 | Theoretical | Report |
| | Korte & Hüsing | 2010 | Empirical | Report |
| | Ala-Mutka | 2011 | Theoretical | Report |
| Technology literacy | Amiel | 2004 | Empirical | Journal |
| | Kahn & Kellner | 2005 | Theoretical | Journal |
| Digital competence | European Parliament and the Council of the European Union | 2006 | Position | Journal |
| | Calvani, Cartelli, Fini & Ranieri | 2008 | Theoretical | Journal |
| | Krumsvik | 2008 | Theoretical | Journal |
| | Ala-Mutka | 2011 | Theoretical | Report |
| | Ilomäki, Kantosalo & Lakkala | 2011 | Theoretical | Project |
| | Ferrari | 2012 | Theoretical | Report |
| | Ferrari, Punie & Redecker | 2012 | Theoretical | Conference |
| | Larraz | 2013 | Empirical | Thesis |
| Digital Media Literacies | Buckingham | 2007 | Theoretical | Journal |
| Media and information literacy | Wilson et al. | 2011 | Theoretical | Report |

Note. Adapted from, "Competencia digital en el siglo XXI" by E. Gallardo-Echenique, 2012.

The terms "computer literacy" or "ICT literacy" are used in several contexts and have variations such as "IT literacy" or "technology literacy". Computer literacy, the term mainly in vogue throughout the 1980s (Bawden, 2008), "often refers to the ability to use a spreadsheet and a word processor and to search the World Wide Web for information" (NRC, 1999, p. 11). According to Hawkins & Paris (1997), computer literacy denoted a level of expertise and familiarity with computers and, especially, their applications. For the International ICT Literacy Panel (2002, p. 2), "ICT literacy is using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society". In response to a request from the National Academy of Sciences (United States), the Committee on Information Technology Literacy of the National Research Council (NRC, 1999) published the report *Being Fluent with Information Technology* to address the subject of information technology literacy. In the report, the authors (NRC, 1999) used the term *fluency* rather than *literacy* because computer literacy "has acquired a 'skills' connotation, implying competency with a few of today's computer applications, such as word processing and e-mail. As the technology changes by leaps and bounds, existing skills become antiquated and

there is no migration path to new skills” (NRC, 1999, p. 2). They also suggest that the choice also responds to a plan to adapt to changes in the technology, to acquire new skills, and to adopt “fluency” as a term connoting a higher level of competency (NRC, 1999).

First coined in 1974, information literacy (Jackman & Jones, 2002), which is rooted in the academic disciplines of library and information science, maintained a low volume in the literature throughout the 1980s but expanded considerably in the 1990s (Bawden, 2001; 2008). It is better to understand information literacy as something much broader than an enhanced form of computer skills or bibliographic instruction (Bawden & Robinson, 2002; Bawden, 2008). According to Jackman & Jones (2002, p. 3), information literacy is “a set of critical workplace and educational skills, reflects the learning challenges inherent in a digital world economy, which is dependent on a highly skilled workforce”. In 2000, the Association of College and Research Libraries (ACRL) developed *Information literacy standards for higher education* and proposed a definition for information literacy as a set of abilities requiring individuals to “recognize when information is needed and have the ability to locate, evaluate, and use effectively the needed information” (ACRL, 2000, p. 2). For ACRL (2000, p.3), “information literacy is related to information technology skills, but has broader implications for the individual, the educational system, and for society”. Similar developments are being undertaken in Australia and New Zealand. The Australian and New Zealand Institute for Information Literacy (ANZILL) and the Council of Australian University Librarians (CAUL) have developed *The Australian and New Zealand Information Literacy Framework*. This *Framework* provides six Information Literacy Standards that define the behaviors and learning outcomes for librarians and educators in teaching and the assessment of information literacy. In the report, information literacy is defined as “an understanding and set of abilities enabling individuals to recognize when information is needed and have the capacity to locate, evaluate, and use effectively the needed information” (Bundy, 2004, p. 3) and “is a ‘prerequisite’ and ‘essential enabler’ for lifelong learning” (Bundy, 2004, p. 4). However, according to Allan Martin (2003), information literacy is not as well established as computer literacy as a part of educational provision.

At the Vienna Conference *Educating for the Media and the Digital Age*, UNESCO (1999, pp. 273-274) defined *media education* as that which allows people “to gain understanding of the communication media used in their society and the way they operate and to acquire skills in using these media to communicate with others and addresses a wide range of texts in all media (print, still image, audio, and moving image) which provide people with rich and diverse cultural experiences”. According to Pérez-Tornero (2004), “media education” is a less used term that retains the educational dimension and “refers specifically to the means of communication, embracing both traditional media (the press, radio, television, etc.) as well as more recent innovations (Internet, second and third generation mobile phones, etc.)” (p. 40). Hague & Williamson (2009) use the terms “digital technology” and “new media” to refer to a wide range of technologies that store and transmit information in digital form. These include computers, the internet and e-mail, mobile phones and other mobile devices and cameras, video games, as well as artificial intelligence, robotics and 3D printing.

Another term that is related to digital competence and used in the literature is media literacy (Bawden, 2001). In the report by the National Leadership Conference (Aufderheide & Firestone, 1993), media literacy is defined as the movement to expand notions of literacy to include the powerful post-print media that dominate our informational landscape and help people understand, produce and negotiate meanings in a culture made up of powerful images, words and sounds. A media-literate person can think critically about what they see, hear and read in books, newspapers, magazines, television, radio, movies, music, advertising, video games, the Internet, and new emerging technology (Henry J. Kaiser Family Foundation, 2003). However, McClure (as cited in Bawden, 2001), who has considered the interrelation of the concepts, prefers to see media literacy as a component of information literacy. In addition, a new definition – 21st century literacy – has emerged in the fields of media literacy, semiotics, iconography, visual cognition, and the arts. The New Media Consortium (NMC) (2005) refers to the subset of abilities and skills where aural, visual and digital literacy overlap and reinforce each other as *21st Century Literacy*. These include the ability to understand the power of images and sounds, to recognize and use that power, to manipulate and transform digital media, to distribute them pervasively, and to adapt them easily to new forms (NMC, 2005).

In 2011, UNESCO suggested unifying notions of media literacy and information literacy under one umbrella term – media and information literacy (MIL) – as a way to “emphasize the

development of enquiry-based skills and the ability to engage meaningfully with media and information channels in whatever form and technologies they are using” (Wilson, Grizzle, Tuazon, Akyempong & Cheung, 2011, p. 18). UNESCO also suggested a competency framework where various literacies (e.g. library literacy, computer literacy, and internet literacy) associated with MIL are linked.

Another term is ‘e-literacy’, which was coined in 2003 by Allan Martin (Martin & Grudziecki, 2006). This is defined as “the assumption that there are skills, awarenesses and understandings which will enable individuals firstly to survive and secondly to be more effective, in their e-encounters” (Martin, 2003, p. 23). According to Martin (as cited himself in Martin 2008, pp. 165-166), “eLiteracy for the individual consists of: a) awareness of the ICT and information environment; b) confidence in using generic ICT and information tools; c) evaluation of information-handling operations and products; d) reflection on one’s own eLiteracy development; e) adaptability and willingness to meet eLiteracy challenges”. According to Lindsey Martin (2006, p. 98), the interpretation of the term e-literacy “suggests the simple provision of basic skills that will allow individuals to enter and survive in the e-world”. According to Joint (2005, p. 147), the terms “eLiteracy” and “information literacy” are different but mutually compatible concepts that are valid in specific contexts.

In 2004 the European e-Skills Forum adopted a definition of the term "e-skills" that encompasses a wide range of capabilities (knowledge, skills and competences), covering three main categories: ICT practitioner skills; ICT user skills, and e-business skills (European e-Skills Forum, 2004; Korte & Hüsing, 2010; see also http://ec.europa.eu/enterprise/sectors/ict/e-skills/index_en.htm). e-Skills is the concept used by the European Commission's DG Enterprise and Industry and the ICT industry to respond to the growing demand for highly-skilled ICT practitioners and users in order to ensure that every citizen is digitally literate in a context of lifelong learning (European Commission, 2007; Ala-Mutka, 2011).

Another concept used in policy documents and initiatives when referring to skills and competences in the information society is eCompetence (Ala-Mutka, 2011). This term, developed by experts, focuses on individual and organizational strategies for integrating ICT in Higher Education (<http://www.ecompetence.info/>). The term is also used and known from the work of the European Committee for Standardisation (CEN) on developing a European e-Competence Framework (e-CF) for ICT practitioners (European e-Competence Framework 2010; Ala-Mutka 2011; see also <http://www.ecompetences.eu/>). According to The European eCompetence Initiative, eCompetence is “one of the key, decisive factors in the full exploitation of the potential of new media” (<http://www.ecompetence.info/>). According to Schneckenberg & Wildt (2006, p. 31), eCompetence “is the ability to use ICT in teaching and learning in a meaningful way”.

Digital literacy, a concept that is closely related to digital competence, was introduced by Paul Gilster in his 1997 book of the same name. This concept has a longer tradition than digital competence and is usually understood as a combination of technical-procedural, cognitive and emotional-social skills. Gilster (1997) defines this concept as the ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers. Digital literacy (Jones-Kavalier & Flannigan, 2006) represents a person’s ability to perform tasks effectively in a digital environment, where “digital” means information represented in numeric form and primarily for use by a computer. Merchant (2009, p. 39) suggested that “the central concern of digital literacy is reading and writing with new technologies – technologies which involve the semiotic of written representation – recognizing that on-screen texts invariably combine writing with other modes of representation”.

According to Eshet-Alkalai (2004, p. 93), “digital literacy involves more than the mere ability to use software or operate a digital device; it includes a large variety of complex cognitive, motor, sociological, and emotional skills, which users need in order to function effectively in digital environments”. In 2004, Eshet-Alkalai proposed a five-skill holistic conceptual model for this concept, arguing that the model covers most of the cognitive skills users employ in digital environments: (a) photovisual digital thinking; (b) reproduction digital thinking; (c) branching digital thinking; (d) information digital thinking; and (e) socio-emotional digital thinking (Eshet-Alkalai (2004, 2009). Because of the rapid evolution of multimedia and game technologies, Eshet-Alkalai (2009) also added real-time digital thinking.

The *Promoting digital literacy* report requested by the European Commission defined digital literacy as “an expression that suggests that the abilities required to use the new technologies are similar in some respects to those required for reading and writing” (Pérez-Tornero (2004, p. 40)). In the context of the eLearning Programme of the European Commission, the DigEuLit project – the goal of which was to develop a European Framework for Digital Literacy (EFDL) – conceived digital literacy as a convergence of several literacies, including elements of ICT literacy, Information Literacy, Media Literacy and Visual Literacy (Martin, 2005). Digital Literacy is “the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze, and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process” (Martin & Grudziecki, 2006, p. 255). Later, Allan Martin (2009, p. 8) proposed three “levels” or stages for the development of digital literacy (see Figure 1). Martin (2009) argued that this definition suggested discussing digital literacy only at levels II or III; digital competence is a requirement for and a precursor of digital literacy but it cannot be described as digital literacy.

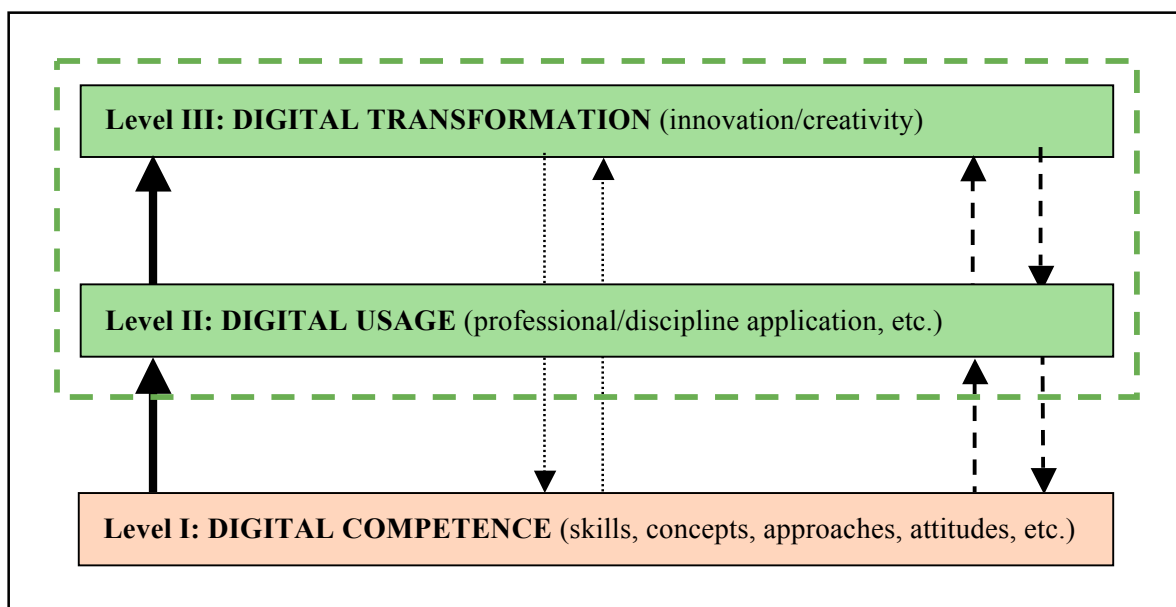


Figure 1. Levels of Digital Literacy. From “Digital literacy for the third age: Sustaining identity in an uncertain world”, by A. Martin, 2009, *eLearning Papers*, 12, p. 8.

According to Nawaz & Kundi (2010), there are two paradigms to digital literacy and two broader theories about the nature and role of ICT in the learning process: Instrumental/Behaviorist and Substantive/Constructivist. The instrumental view considers technology as a ‘tool’ with no inherent value, while the substantive view argues that technology is not neutral and has positive or negative impacts (Nawaz & Kundi, 2010). Taking this reflective and critical approach, some authors suggest that digital literacy cannot be limited to a purely utilitarian and reductive view of certain digital skills but is linked to a broader, more critical view of society in an era of technological revolution (Buschman, 2010; Kahn & Kellner, 2005).

In 1993, the term “new literacies” was coined by David Buckingham, and his definition has been conceptualized in different ways by different groups of scholars. According to Buckingham (2007), this proliferation of literacies may be fashionable and carries a degree of social status. Buckingham (2011) suggests that the meaning attributed to digital literacy tends to be narrower, relates to the technology itself and demands a much broader reconceptualization of what literacy means in a world increasingly dominated by electronic media. According to Leu (2000), literacy is increasingly deictic, continually and rapidly changing as new technologies emerge in an age of information. Becoming literate is seen not in terms of “acquiring the ability to take advantage of the literacy potential inherent in a single, static, technology of literacy (e.g. traditional print technology), but rather by a larger mindset and the ability to continuously adapt to the new literacies required by the new technologies that rapidly and continuously spread,

particularly through the Internet” (Coiro, J., Knobel, Lankshear & Leu, 2008, p. 5). According to Coiro et al. (2008), new literacies are identified with an epochal change in technologies and associated changes in social and cultural ways of doing things, ways of being, and ways of viewing the world.

In an age of increased digital communication, the terms ‘multiliteracies’, ‘new literacies’, ‘multimodal texts’, ‘multimodal discourse’ and ‘multimodality’ represent attempts to describe the textual shift that has occurred and to conceptualize the changed learning paradigm that is fundamental to literacy and learning (Walsh, 2009). According to Jewitt (2008, p. 242) “the concept of multiple literacies has emerged in response to the theorizations of the new conditions of contemporary society”. Rejecting the plural form “literacies”, multimodality or multimodal literacy was initially developed by researchers at the Institute of Education of London University (Kress & Van Leeuwen, 1996; Kress, 2003; 2006; Jewitt & Kress, 2003; Jewitt, 2006; 2008). A basic assumption of multimodal theory is that “both learning and sign-making are dynamic processes which change the resources through which the processes take place – whether as concepts in psychology or as signs in semiotics – and change those who are involved in the processes” (Kress, 2003, p. 40). Jewitt claims that the way knowledge is represented, as well as the mode and media chosen, is a crucial aspect of knowledge construction, making the form of representation integral to meaning and learning more generally (Jewitt, 2008).

An institutional definition comes from the European Commission. Digital competence, as defined in the European Parliament and the Recommendation on Key Competences for Lifelong Learning of the Council of the European Union (2006, p. 13), “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”.

Another way to define the concept, provided by Calvani, Cartelli, Fini & Ranieri (2008, p. 186), suggests that digital competence involves “being able to explore and face new technological situations in a flexible way, to analyze, select and critically evaluate data and information, to exploit technological potentials in order to represent and solve problems and build shared and collaborative knowledge, while fostering awareness of one’s own personal responsibilities and the respect of reciprocal rights/obligations”. Also, the definition proposed by Calvani, Fini and Ranieri (2010), emphasizes the co-existence of dimensions that are characterized both on the technological, cognitive and ethical levels and by their integration. The chart below (Calvani et al., 2010) summarizes this model.

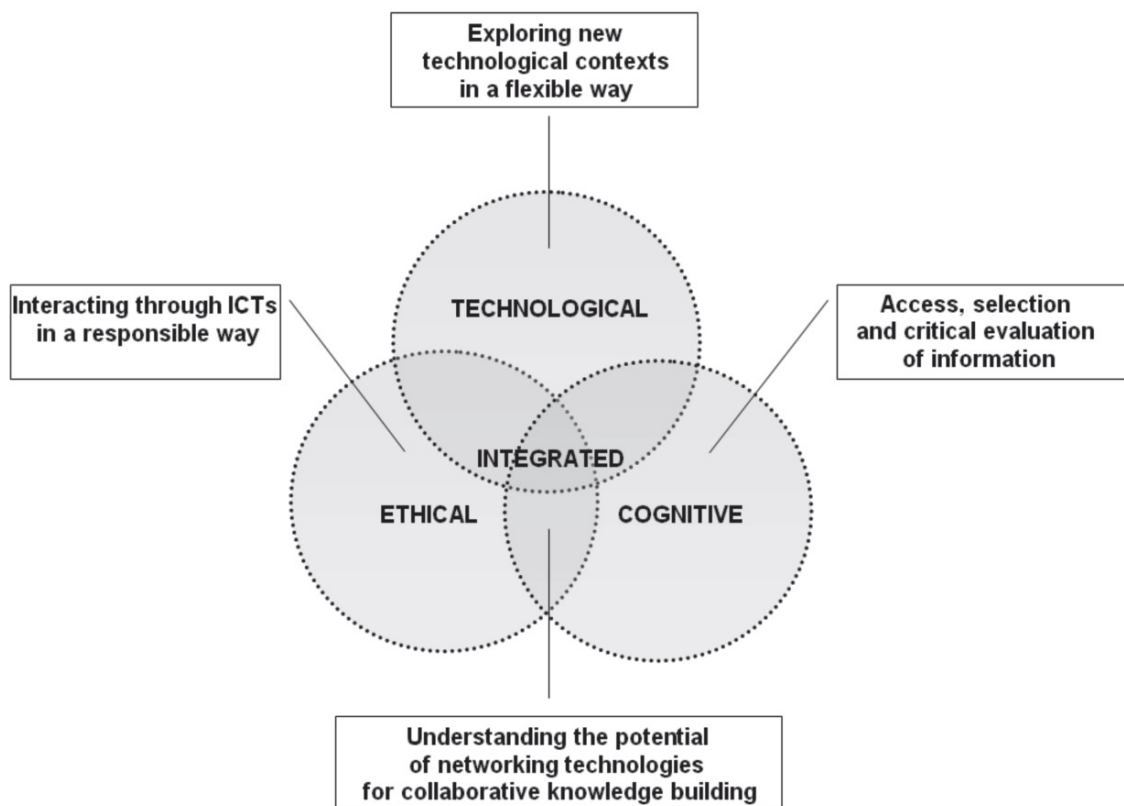


Figure 2. Digital Competence Framework. From “Digital Competence in K-12: theoretical models, assessment tools and empirical research”, by A. Calvani, A. Fini, and M. Ranieri, 2010, *Analisi: Quaderns de Comunicació i Cultura*, 40, p. 163.

A recent study that aimed to identify, select and analyze current frameworks, identified the following competences: Information management, collaboration, communication and sharing, creation of content and knowledge, ethics and responsibility, evaluation and problem-solving, and technical operations (Ferrari 2012). Ferrari (2012) proposes the following definition:

Digital Competence is the set of knowledge, skills, attitudes (thus including abilities, strategies, values and awareness) that are required when using ICT and digital media to perform tasks; solve problems; communicate; manage information; collaborate; create and share content; and build knowledge effectively, efficiently, appropriately, critically, creatively, autonomously, flexibly, ethically, reflectively for work, leisure, participation, learning, socializing, consuming, and empowerment (p. 43).

According to Ferrari, Punie and Redecker (2012), there are two main approaches to the concepts of digital literacy and digital competence. The first understands digital competence at the convergence of multiple literacies; the second understands digital competence as a new literacy that goes beyond the sum of the various literacies (internet literacy, ICT literacy, information literacy and media literacy) and involves other components that come into the framework of digital competence.

A new definition has recently been developed by Larraz (2013), who theorizes digital competence as the capacity to mobilize different "literacies" to manage the information and communicate knowledge and solve issues in an evolving society. According to Larraz (2013), digital competence requires the presence of four literacies: a) *information literacy*, for managing digital information; b) *computer literacy*, for treating data in different formats; c) *media literacy*, for analyzing and creating multimedia messages; and d) *communication literacy*, for participating in a safe, ethical and civic manner from a digital identity.

To be in line with the European Recommendation, we decided to adopt the term “digital competence” proposed by Larraz. We believe it is important to bring together academics, policymakers and practitioners from numerous backgrounds in order to enable people to make informed decisions in response to the new challenges presented by the knowledge society in all

areas of their learning system (personal, professional and social), and, most importantly, to learn how to learn throughout their lives.

Conclusion

This study has identified the extensive theoretical and literary diversity surrounding the term "digital competence". We have shown that authors and researchers, in attempting to coin new concepts, have provided multiple definitions: some are similar, others are quite differentiated, and many are redundant. Our review shows that digital competence and digital literacy are closely related but not identical. Table 3 provides a summary of the nuances and subtleties identified in the literature that are helpful for distinguishing between digital competence and digital literacy.

Table 3.

Differences between digital competence and digital literacy

| Digital competence | Digital literacy |
|---|---|
| An employability requirement of the digital age | Conceptualizations of the changing learning paradigm in the digital age |
| A 'skills' connotation, implying competency with some of today's computer applications, including word processing and e-mail, etc. | Deictic approaches to learning and communication |
| Set of abilities needed to apply digital technologies to work, leisure and education | Set of understandings needed in the digital era to understand, produce and negotiate meaning in a culture made up of powerful images, words and sounds |
| Skills people should have in the digital era | An assumption that skills, awarenesses and understandings exist that will enable individuals first to survive and second to be more effective in their e-encounters |
| Skills to communicate with others and address a wide range of texts in all media | A combination of technical-procedural, cognitive and emotional-social skills |
| A range of capabilities (knowledge, skills and competences) covering three main categories: ICT practitioner skills; ICT user skills, and e-business skills | Processes of awareness, confidence, evaluation, reflection, adaptability and willingness to meet the digital age challenges |
| Demonstrated ability to apply knowledge, skills and attitudes to achieve observable results; measurable performance through rubrics | Ability to understand and use information in multiple formats from a wide range of sources when this is presented via computers |
| Confident and critical use of Information Society Technology (IST) for work, leisure and communication | Complex cognitive, motor, sociological, and emotional skills that users need in order to function effectively in digital environments |
| 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 | Awareness, attitude and underlying abilities needed to use digital tools appropriately and to reflect upon this process |

Although the concept of digital literacy seems to be the one most widely used internationally, the term digital competence is often used synonymously, especially in the European context (Ferrari, 2012; Krumsvik, 2008). However, the two terms do not always have the same

connotations or the same level of abstraction depending on the linguistic context and the perspective in which they are implemented (Meyers et al., 2013).

On the basis of this literature review, digital competence may be considered a multi-faceted concept that emerges from several backgrounds (Ala-Mutka, 2011; Ilomäki, Kantosalo & Lakkala, 2011b; Gallardo-Echenique, 2012; Ferrari, 2012). It is closely related to literacy approaches but is not identical. Digital competence is regarded as a core competence in policy papers but it is not yet a stable concept (Ilomäki, Kantosalo & Lakkala, 2011a; Gallardo-Echenique, 2012). These different notions mean there are still no clear assessment guidelines for digital competence (Ananiadou & Claro, 2009). While some perceive digital competence as the technical use of ICT, others define it more broadly as knowledge application or as 21st-century skills.

The Information and Knowledge Society highlights the need for “an educated citizenry capable of accessing, evaluating, organizing, interpreting, and disseminating information in increasingly digital formats exchanged over enabling technologies” (Somerville, Lampert, Dabbour, Harlan & Schader, 2007, p. 9). It is essential that people develop a new sense of self-confidence to master technology and digital services. As educators and researchers, our goals should be to encourage citizens to develop the skills, knowledge, ethical frameworks, and self-confidence that will serve them well in the future (Jenkins, 2006; Jenkins, Clinton, Purushotma, Robison & Weigel, 2006).

Given these challenges, institutions and policymakers should set out their current educational priorities for an effective response to the changing needs of 21st-century learners. Proper acquisition of digital competence or digital literacy, understood from the holistic and emancipatory perspective, is key to active and functional participation in contemporary society. This challenge, in addition to the initial and continuing digital training of teachers, is just one of the relevant issues that will need to be addressed in future research.

Limitation of the study

The search was limited to English and Spanish language sources. Relevant publications containing important and useful information may also exist in other languages.

Acknowledgements

The authors would like to thank the blind reviewers of this paper for their thorough and invaluable feedback.

References

- Ala-Mutka, K. (2011). *Mapping digital competence: Towards a conceptual understanding*. Seville: European Commission, JRC-IPTS.
- Amiel, T. (2006). Mistaking computers for technology: Technology literacy and the digital divide. *AACE Journal*, 14(3), 235–256.
- Ananiadou, K., & Claro, M. (2009). 21st century skills and competences for new millennium learners in OECD countries. *OECD Education Working Papers*, (41). doi:10.1787/218525261154
- Area, M., Gutiérrez, A., & Vidal, F. (2012). *Alfabetización digital y competencias informacionales* (p. 225). Madrid/Barcelona: Editorial Ariel, S.A., Fundación Telefónica y Fundación Encuentro.
- Aufderheide, P. & Firestone, C.M. (1993) *Media literacy: a report of the National Leadership Conference on media literacy*, Aspen Institute, Washington, DC.
- Bawden, D. (2001). Information and digital literacies: a review of concepts. *Journal of Documentation*, 57(2), 218–259. doi:10.1108/EUM0000000007083
- Bawden, D., & Robinson, L. (2002). Promoting literacy in a digital age: approaches to training for information literacy. *Learned Publishing*, 15(4), 297–301.
- Bawden, D. (2008). Origins and concepts of digital literacy. In C. Lankshear & M. Knobel (Eds.), *Digital literacies: Concepts, policies and practices* (pp. 17–32). New York, NY: Peter Lang.
- Belshaw, D. A. J. (2011). *What is 'digital literacy'? A pragmatic investigation* (Doctoral dissertation). Durham University.

- Braun, V., & Clarke, V. (2006). Using thematic analysis in psychology. *Qualitative Research in Psychology*, 3(2), 77–101. doi:10.1191/1478088706qp063oa
- Breyer, J., Hook, T., & Marinoni, C. (2007). *Towards a European e-Competence Framework – Interim report*. CEN – European Committee for Standardization.
- Buckingham, D. (1993). Towards new literacies, information technology, English and media education. *The English and Media Magazine*, 20-25.
- Buckingham, D. (2007). Digital media literacies: rethinking media education in the age of the Internet. *Research in Comparative and International Education*, 2(1), 43–55. doi:10.2304/rcie.2007.2.1.43
- Bundy, A. (2004). *Australian and New Zealand information literacy framework: Principles, standards and practice* (2nd. ed.). Adelaide: Australian and New Zealand Institute for Information Literacy (ANZIIL).
- Buschman, J. (2010). Alfabetización informacional, "nuevas" alfabetizaciones y alfabetización. *Boletín de la Asociación Andaluza de Bibliotecarios*, 98-99, 155-18. Málaga: Asociación Andaluza de Bibliotecarios (AAB).
- Calvani, A., Cartelli, A., Fini, A., & Ranieri, M. (2008). Models and instruments for assessing digital competence at school. *Journal of E-Learning and Knowledge Society*, 4(3), 183 – 193.
- Calvani, A., Fini, A., & Ranieri, M. (2010). Digital Competence In K-12: Theoretical models, assessment tools and empirical research. *Anàlisi: quaderns de comunicació i cultura*, 40, 157–171.
- Coiro, J., Knobel, M., Lankshear, C., & Leu, D. J. (2008) *Handbook of research on new literacies*. New York/London: Routledge.
- Cope, B. & Kalantzis, M. (Eds.) (2000). *Multiliteracies: Literacy learning and the design of social futures?* Melbourne: Macmillan.
- European Commission. (2007). *Communication from the Commission to the Council, the European Parliament, the European Economic and Social Committee and the Committee of the Regions - E-skills for the 21st century: Fostering competitiveness, growth and jobs* (COM/2007/0496 final). Brussels: Commission of the European Communities.
- European Commission (2013). *Digital Agenda for Europe: A Europe 2020 Initiative*. Retrieved from <http://ec.europa.eu/digital-agenda/en>
- European e-Competence Framework (2007). *Towards a European e-Competence Framework: A Guideline for its development*. EU: European e-Competence Framework (e-CF).
- European e-Competence Framework. (2010). *Building the e-CF - a combination of sound methodology and expert contribution* (e-CF 2.0 CWA Part III September 2010). EU: European e-Competence Framework (e-CF).
- European eCompetence Initiative (s/f). Retrieved from <http://www.ecompetence.info/>
- European Parliament and the Council of the European Union (2006). Recommendation of the European Parliament and of the Council of 18 December 2006 on key competences for lifelong learning. *Official Journal of the European Union*, L394, 10-18.
- European e-Skills Forum. (2010). *E-skills for Europe: Towards 2010 and beyond* (Synthesis report). Brussels: European Commission.
- Eshet, Y. (2002). Digital literacy: A new terminology framework and its application to the design of meaningful technology-based learning environments. In P. Barker & S. Rebelsky (Eds.), *Proceedings of ED-Media 2002 World Conference on Educational Multimedia, Hypermedia and Telecommunications* (pp. 493–498). Norfolk, VA: Association for the Advancement of Computing in Education (AACE).
- Eshet-Alkalai, Y. (2004). Digital Literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia*, 13(1), 93–106.

- Eshet-Alkalai, Y. (2009). Real-time thinking in the digital era. In M. Khosrow-Pour (Ed.), *Encyclopedia of Information Science and Technology* (2nd ed., pp. 3219–3223). USA: Information Resources Management Association. doi:10.4018/978-1-60566-026-4.ch514
- Ferrari, A. (2012). *Digital competence in practice: An analysis of frameworks* (p. 92). Luxembourg: Publications Office of the European Union. doi:10.2791/82116
- Ferrari, A., Punie, Y., & Redecker, C. (2012). Understanding Digital Competence in the 21st Century: An Analysis of Current Frameworks. In A. Ravenscroft, S. Lindstaedt, C. Delgado Kloos, & D. Hernández-Leo (Eds.), *Proceedings 7th European Conference on Technology Enhanced Learning, EC-TEL2012* (pp. 79–92). New York: Springer.
- Gallardo-Echenique, E. (2012). Competencia digital en el siglo XXI. Paper presented at *Congreso Internacional de Educación Superior: La formación por competencias*. Chiapas, México: Universidad Autónoma de Chiapas.
- Gilster, P. (1997). *Digital literacy*. New York: Wiley.
- Hague, C., & Williamson, B. (2009). *Digital participation, digital literacy and school subjects: A review of the policies, literature and evidence* (p. 30). Bristol, UK: Futurelab.
- Hawkins, R., & Paris, A. E. (1997). Computer literacy and computer use among college students: Differences in Black and White. *The Journal of Negro Education*, 66(2), 147–158.
- Henry J. Kaiser Family Foundation. (2003). *Key facts: Media literacy*. Menlo Park, CA: Henry J. Kaiser Family Foundation.
- Hepple, E., Sockhill, M., Tan, A., & Alford, J. (2014). Multiliteracies Pedagogy: Creating claymations with adolescent, post-beginner English language learners. *Journal of Adolescent & Adult Literacy*, 58(3), 219–229. doi:10.1002/jaal.339
- Hüsing, T., & Korte, W. B. (2010). *Evaluation of the implementation of the communication on e-Skills for the 21st century* (p. 322). Bonn, Germany: European Commission and the European e-Skills Steering Committee.
- Iloäki, L., Kantosalo, A., & Lakkala, M. (2011). *What is digital competence?* Brussels: EUN Partnership AISBL.
- International ICT Literacy Panel. (2002). *Digital Transformation: A Framework for ICT Literacy. A Report of the International ICT Literacy Panel. Educational Testing* (p. 42). Princeton, NJ: Educational Testing Service.
- Jackman, L. W., & Jones, L. D. (2002). Information Literacy, Information Communications Technologies (ICT) and the Nongovernmental Organization (NGO)/non profit world: as practitioner's perspective. In *Information Literacy Meeting of Experts*. Prague, The Czech Republic: UNESCO, the U.S National Commission on Libraries and Information Science, and the National Forum on Information Literacy.
- Jenkins, H. (2006). *Convergence culture: Where old and new media collide*. New York: New York University Press.
- Jenkins, H., Clinton, K., Purushotma, R., Robison, A. J., & Weigel, M. (2006). *Confronting the Challenges of Participatory Culture: Media Education for the 21 Century. Program* (The John D. and Catherine T. MacArthur Foundation Reports on Digital Media and Learning). Chicago: The MacArthur Foundation.
- Jewitt, C. (2008). Multimodality and Literacy in School Classrooms. *Review of Research in Education*, 32(1), 241–267. doi:10.3102/0091732X07310586
- Jewitt, C. & Kress, G. (Cords.) (2003). *Multimodal Literacy*. New York: Peter Lang.
- Joint Information Systems Committee (JISC). (2013). *Developing Digital Literacies (JISC report)*. UK: Joint Information Systems Committee (JISC).
- Joint, N. (2005). eLiteracy versus information literacy at eLit2005: What's the difference, which should we prefer? *Journal of eLiteracy*, 2(2), 144–147.
- Jones-kavalier, B. B. R., & Flannigan, S. L. (2006). Connecting the Digital Dots: Literacy of the 21st Century. *Educuse Quartely*, 2, 8–10.

- Kahn, R., & Kellner, D. (2005). Reconstructing technoliteracy: A multiple literacies approach. *E-Learning and Digital Media*, 2(3), 238-251.
- Kress, G. (2003). *Literacy in the New Media Age*. London: Routledge.
- Kress, G. (2006). Meaning, learning and representation in a social semiotic approach to multimodal communication, In A. McCabe, M. O'Donnell & R. Whittaker (Ed.) *Advances in Language and Education*, London: Continuum.
- Kress, G. (2010). *Multimodality: a social semiotic approach to contemporary communication*. NY: Routledge.
- Kress, G., Jewitt C., Ogborn, J. & Tsatsarelis, C. (2001). *Multimodal teaching and learning: the rhetorics of the science classroom*. London/New York: Continuum.
- Kress, G. & Van Leeuwen, T. (1996, 2006). *Reading Images: The Grammar of Visual Design*. London, UK: Routledge.
- Kress, G. & Van Leeuwen, T. (2001). *Multimodal Discourse: The modes and media of contemporary communication*. London: Routledge.
- Krumsvik, R. J. (2008). Situated learning and teachers' digital competence. *Education and Information Technologies*, 13(13), 279-290. doi:10.1007/s10639-008-9069-5
- Lankshear, C., & Knobel, M. (2008). *Digital literacies: concepts, policies and practices*. New York, NY: Peter Lang.
- Leu, D. J. (2000). Literacy and technology: Deictic consequences for literacy education in an information age. In M. L. Kamil, P. Mosenthal, P. D. Pearson & R. Barr (Eds.), *Handbook of Reading Research* (vol. III, pp. 743–770). Mahwah, NJ: Erlbaum.
- Leu, D. (2001). Literacy on the Internet: Internet project: Preparing students for new literacies in a global village. *Reading Teacher*, 54(6), 568–572.
- Leu, D. J., Zawilinski, L., Castek, J., Banerjee, M., Housand, B. C., Liu, Y., & O'Neil, M. (2007). What is new about the new literacies of online reading comprehension? In L. Rush, A. J. Eakle, & A. Berger (Eds.), *Secondary school literacy: What research reveals for classroom practice* (pp. 37–68). Urbana, IL: National Council of Teachers of English (NCTE).
- Martin, A. (2003). Essential E-literacy. *Connected*, 9, 22–24.
- Martin, A. (2005). DigEuLit – a European framework for digital literacy: A progress report. *Journal of eLiteracy*, 2, 130–136.
- Martin, A., & Grudziecki, J. (2006). DigEuLit: Concepts and tools for digital literacy development. *ITALICS, Innovation in Teaching and Learning in Information and Computer Sciences*, 5(4), 249–267.
- Martin, A. (2008). Digital literacy and the digital society. In C. Lankshear & M. Knobel (Eds.), *Digital literacies: Concepts, policies and practices* (vol. 30, pp. 151-176). New York: Peter Lang.
- Martin, A. (2009). Digital literacy for the third age: Sustaining identity in an uncertain world. *eLearning Papers*, (12), 1–15.
- Martin, L. (2006). Enabling eLiteracy: Providing non-technical support for online learners. *ITALICS, Innovation in Teaching and Learning in Information and Computer Sciences*, 5(4), 97–108.
- Merchant, G. (2009). Literacy in virtual worlds. *Journal of Research in Reading*, 32(1), 38–56. doi:10.1111/j.1467-9817.2008.01380.x
- Meyers, E. M., Erickson, I., & Small, R. V. (2013). Digital literacy and informal learning environments: An introduction. *Learning, Media and Technology*, 38(4), 355-367. doi:10.1080/17439884.2013.78359
- National Research Council (1999). *Being fluent with information technology*. Washington, DC: National Academy Press.

- Nawaz, A., & Kundi, G. M. (2010). Digital literacy: An analysis of the contemporary paradigms. *Journal of Science and Technology Education Research*, 1(2), 19-29.
- New Media Consortium (NMC) (2005). *A global imperative: The report of the 21st century literacy summit*. Austin, TX: NMC.
- Pérez-Tornero, J. M. (2004). *Promoting digital literacy: Understanding digital literacy* (Final report. EAC/76/03). Brussels: European Commission.
- Pérez Tornero, J. M., & Varis, T. (2010). *Media Literacy and New Humanism*. (J. M. Pérez Tornero & T. Varis, Eds.). Moscow: UNESCO Institute for Information Technologies in Education.
- Schneckenberg, D. & Wildt, J. (2006). Understanding the concept of eCompetence for academic staff. In I. MacLabhrainn, C. McDonald Legg, D. Schneckenberg & J. Wildt (Eds.), *The challenge of eCompetence in academic staff development*. Galway, Ireland: CELT/eComplnt Publications.
- Somerville, M. M., Lampert, L. D., Dabbour, K. S., Harlan, S., & Schader, B. (2007). Toward large scale assessment of information and communication technology literacy: Implementation considerations for the ETS ICT literacy instrument. *Reference Services Review*, 35(1), 8-20. doi:10.1108/00907320710729337
- Tan, L., & Guo, L. (2014). Multiliteracies in an outcome-driven curriculum: Where is its fit? *The Asia-Pacific Education Researcher*, 23(1), 29–36. doi:10.1007/s40299-013-0082-0
- United Nations Educational, Scientific and Cultural Organization (UNESCO). (1999). *Educating for the Media and the Digital Age*. (S. Krucsay, Ed.). Vienna: Austrian Federal Ministry of Education and Cultural Affairs & UNESCO.
- United Nations Educational Scientific and Cultural Organization (UNESCO). (2006). *Education for All: Literacy for life* (Global Monitoring Report). Paris, France: UNESCO.
- Unsworth, L. (2001). *Teaching multiliteracies across the curriculum: Changing contexts of text and image in classroom practice*. Buckingham, UK: Open University Press.
- Walsh, M. (2009). Pedagogic Potentials of Multimodal Literacy. In L. Tan Wee Hin, & R. Subramanian (Eds.), *Handbook of research on new media literacy at the K~12 level: Issues and challenges* (vol. 1, pp. 32–47). U.S: IGI Global.
- Wilson, C., Grizzle, A., Tuazon, R., Akyempong, K., & Cheung, C.-K. (2011). *Media and Information Literacy Curriculum for Teachers*. Paris, France: UNESCO.
-



This work is published under a Creative Commons Attribution-Non-Commercial-Share-Alike License

For details please go to: <http://creativecommons.org/licenses/by-nc-sa/3.0/us/>