UNIVERSITY OF HELSINKI

https://helda.helsinki.fi

What is digital competence?

Ilomäki, Liisa; Kantosalo, Anna; Lakkala, Minna

2011

http://hdl.handle.net/10138/154423

Ilomäki, L, Kantosalo, A & Lakkala, M 2011, What is digital competence? in Linked portal. European Schoolnet (EUN), Brussels, pp. 1-12.

Downloaded from Helda, University of Helsinki institutional repository. https://helda.helsinki.fi
This is an electronic reprint of the original article.
This reprint may differ from the original in pagination and typographic detail.
Please cite the original version.

Ilomäki, L., Kantosalo, A., & Lakkala, M. (2011). What is digital competence? In *Linked portal*. Brussels: European Schoolnet. http://linked.eun.org/web/guest/in-depth3

The authors of these documents or materials ("the works") are Liisa Ilomäki, Anna Kantosalo and Minna Lakkala. The copyright in the works belongs to EUN Partnership AISBL who commissioned them. The works shall not be modified or adapted without the express written consent of the copyright owner. Any reproduction of the works by any means must include this copyright notice.

What is digital competence?

Liisa Ilomäki, Anna Kantosalo and Minna Lakkala

1. Introduction

During recent years, *digital competence* has become a key concept in the discussion of what kind of skills and understanding people should have in the knowledge society. It is more or less a political concept, reflecting beliefs and even wishes about future needs, and has its roots in the economical competition in which the new technologies are regarded as an opportunity and a solution (e.g. Punie, 2007, see also Sefton-Green, Nixon & Erstad, 2009; OECD, 2010). In research, the concept is still seldom used. Because of the novelty of the concept, we decided to consider *digital competence* from two points of view: first, based on research evidence and, second, based on some main policy-related papers. It was also needed to consider the synonyms and the related concepts to cover the entity of digital competence because the technologies are in rapid change, and they change also the practices and the necessary competences.

2. Digital competence is an evolving concept

Digital competence is the most recent concept describing technology-related skills. During the recent years, several terms have been used to describe the skills and competence of using digital technologies, such as ICT skills, technology skills, information technology skills, 21st century skills, information literacy, digital literacy, and digital skills. These terms are also often used as synonyms; e.g. digital competence and digital literacy (as an example, see Adeyemon, 2009; Krumsvik, 2008).[1] Sometimes the terms are narrow, e.g., Internet skills, referring only to a limited area of digital technology, and some of them widen the content to media and literacy, e.g., media literacy skills or digital literacy. Jenkins, Clinton, Purushotma, Robinson, and Weigel (2006) investigated the necessary digital skills through participatory cultures; they speak about 21st century literacy, emphasizing social skills instead of individual skills. The wide variety of terms reflects the rapid development of technologies but also different areas of interest, such as library studies or computer science (Arnone & Reynolds, 2009; Jones-Kavalier & Flannigan, 2008). Moreover, changes in society and culture, based on the new technology, have effects on terms. It is expected that the content and the scope will still change, and that is even expected: Alamutka, Punie and Redecker (2008) recommend in their policy-related paper that the approaches should be dynamic and regularly revised because of the evolving new technologies

[1] In this paper, we have used research and policy papers that use also *digital literacy* or *information literacy* when these are used as synonym to *digital competence* because it is not yet a common term

and their use in society. OECD suggests that governments should make effort to identify and conceptualise the required set of skills and competences, and then incorporate them into the educational standards (OECD, 2010); and, as an answer to this suggestion, there are several national projects working for defining national standards.

There is not yet any general, research-based acceptance and justification of the concepts, as van Deursen and van Dijk (2009) stated, referring to terms and various interpretations about Internet skills and digital skills (see also Aviram & Eshet-Alkalai, 2006; Jones-Kavalier & Flannigan, 2008). This lack of theoretical justification results to different definitions that ignore the full range of skills and focus only on some limited skills, e.g., for practical purposes of educators and designers (Aviram & Eshet-Alkalai, 2006). In addition, *digital competence* is policy-related, sometimes used in a normative way, representing goals to be achieved. (Because of lack of research, in this paper, we have also used policy papers, such as papers by OECD, EU or UNESCO.)

In recent publications, the term *competence* is more used than *skills*, reflecting the need for a wider and more profound content of the concepts. The relation between *competence* and *skills* is defined in an OECD project as follows: "A competency is more than just knowledge and skills. It involves the ability to meet complex demands, by drawing on and mobilizing psychosocial resources (including skills and attitudes) in a particular context." (OECD, 2005, p. 4). In the widest and most recent definitions, based on policy-related papers and reports, digital competence consists not only of digital skills but also social and emotional aspects for using and understanding digital device. The European Commission (see Punie & Cabrera, 2006) has defined digital competence as involving the confident and critical use of Information Society Technology for work, leisure and communication. Digital competence is grounded on basic skills in ICT, i.e. the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.

Examples of related concepts

1. Digital literacy

An example of a concept used close to digital competence and often as a synonym is *digital literacy.* This concept has a longer tradition than digital competence, connected to media literacy (Erstad, 2010), and there are studies about digital literacy related, e.g., to education (Sefton-Green, Nixon and Erstad, 2009). The elaboration of this concept is connected both to traditional literacy as well as to media studies. An example of such a definition is the one that Jones-Kavalier and Flannigan (2008) suggested: Digital literacy represents a person's ability to perform tasks effectively in a digital environment; *digital* means information represented in numeric form and primarily use by a computer, and *literacy* includes the ability to read and interpret media, to reproduce data and images through digital manipulation and to evaluate and apply new knowledge gained from digital environments. Aviram and Eshet-Alkalai (2006) described digital literacy as a combination of technical-procedural, cognitive and emotional-social skills. Sefton-Green, Nixon and Erstad (2009) explained that the concept is used to describe our engagements with digital technologies as they mediate many of our social interactions; they say, however, that the literacies associated with participation in digital practices and cultures are complex. The authors regard the concept *digital literacy* fundamentally useful but it needs to be analysed far more at the intersection formal and informal learning domains.

There are several approaches to digital literacy, and several ways of defining the concept; even increasing fuzziness of the concepts *text* and *literacy* (Carrington (2005). For Carrington, the change of printed text to digital "texts" is a profound change also concerning participation in the open and interactive literacy culture. It is typical to see digital literacy in a wide and general way; for example, Erstad (2007), defined it, referring to his book (Erstad, 2006), as "skills, knowledge and attitudes in using digital media to be able to master the challenges in the learning society". Similarly, Eshet-Alkali and Amichai-Hamburger (2004) gave a broad meaning to the term: they suggested digital literacy to consist of five major digital skills: photo-visual skills ("reading" instructions from graphical displays), reproduction skills (utilizing digital reproduction to create new, meaningful materials from existing ones), branching skills (constructing knowledge from non-linear, hypertextual navigation), information skills (evaluating the quality and validity of information), and socio-emotional skills (understanding the "rules" that prevail in cyberspace and applying this understanding in online cyberspace communication). In addition, one more skill was added to the list: real-time thinking skill (the ability to process and evaluate large volumes of information in real time (Aviram & Eshet-Alkalai, 2006).

Another way of defining the concept is to broaden the traditional concept of literacy and investigate what kind of new features digitalism brings to the content of literacy[2]. Leu, Kinzer, Coiro, and Cammack (2004) suggested principles for the new literacies, and all these were additions to traditional literacy (e.g., "The relationship between literacy and technology is transactional" and "Critical literacies are central to the new literacies"); they also expanded literacy to education (e.g., "Learning is often socially constructed within new literacies" and "Teachers become more important, though their role changes, within new literacy classrooms"). Another example of broadening the scope of literacy is Merchant (2007) who regarded it "important to place written (symbolic) presentation at the heart of any definition of digital literacy" (p.121), which is then mediated by new technology. He defended this approach with examples of new technologies, which, although strongly visual, incorporated also a strong element of writing. Multimodality is an essential characteristic of digital literacy, as is the context within which it is created and in which it is to be used. Merchant (2007) continued by introducing the concept *critical digital literacy* with which he emphasized the responsibility to provide the young with tools and understanding to interpret the constructed nature of popular culture and to investigate it critically (see also Hague & Williamson, 2009). It is obvious that good digital skills are based on such academic skills as reading and writing. Hague and Williamson (2009) have a research-based but practically oriented definition which connect digital literacy to literacy but expand it "to the reading and writing of digital texts" (p.5), and in this sense, it means the functional skills required to operate and communicate with technology and media. (Several researchers, like Twist and Withers (2007), emphasized that digital literacy should not be about replacing existing literacies: reading, writing and numeracy are crucial skills for full participation in a digital society. However, the content and the scope of basic digital skills need to be changed.

[2] This kind of developmental approach from literacy – new literacies – digital literacy is similar to the development of *digital competence* : computer skills – ICT skills –digital skills – digital competence. E.g., Leu, Kinzer, Coiro, and Cammack (2004, p. 1572) define the new literacies "of the Internet and other ICTs include the skills, strategies, and dispositions necessary to successfully use and adapt to the rapidly changing information and communication technologies that continuously emerge in our world and influence all areas of our personal and professional lives. These new literacies allow us to use the Internet and other ICTs to identify important questions, locate information, critically evaluate the usefulness of that information, synthesize information to answer those questions, and then communicate the answers to others".

Erstad (2010) broadens digital literacy to media literacy and he suggests the following aspects of media literacies as part of school-based learning: 1) Basic skills, 2) Media as an object of analysis, 3) Knowledge building in subject-domains, 4) learning strategies, and 5) Digital Bildung/ Cultural competence.

2. Literacy skills for the twenty-first century

Close to *digital competence* (or *skills*) are *literacy skills for the twenty-first century*, sometimes also the form *21-century skills* is used. Jenkins et al. (2006) define these as skills that enable participation in the new communities emerging within a networked society. These skills consist of:

- play (the capacity to experiment with the surroundings as a form of problem-solving),
- performance (the ability to adopt alternative identities for the purpose of improvisation and discovery)
- simulation (the ability to interpret and construct dynamic models of real world processes)
- appropriation (the ability to meaningfully sample and remix media content)
- multitasking (the ability to scan one's environment and shift focus)
- distributed cognition (the ability to interact meaningfully with tools that expand mental capacities)
- collective intelligence (the ability to pool knowledge and compare notes with others toward a common goal)
- judgment (the ability to evaluate the reliability and credibility of different information sources)
- transmedia navigation (the ability to follow the flow of stories and information across multiple modalities
- networking (the ability to search for, synthetisize and disseminate information
- negotiation (the ability to travel across diverse communities, discerning and respecting multiple perspectives, and grasping and following alternative norms)

3. Digital divide

A concept which is often discussed together with digital skills is *digital divide*: concepts digital competence / digital skills are often used when investigating the digital divide. Digital divide was originally used to describe different social groups' unequal access to digital services, and differing abilities to make use of various digital possibilities (see Norris, 2001; van Dijk & Hacker, 2003). At present, the concept is also used to emphasize the role of social and cultural circumstances and competences in using digital resources. The *quality of use* creates the digital divide, and the digital competence is needed for a higher quality of use. (Quality can mean e.g. passive, consumer-type of use instead of active use for personal creation and development.) To overcome the educational and social problems of the digital divide, there is a large body of studies concerning the best educational practices as well as pilots and practical experiments.

Summary: Digital competence and the related concepts

Figure 1 below shows the various background disciplines and the related concepts of digital competence.

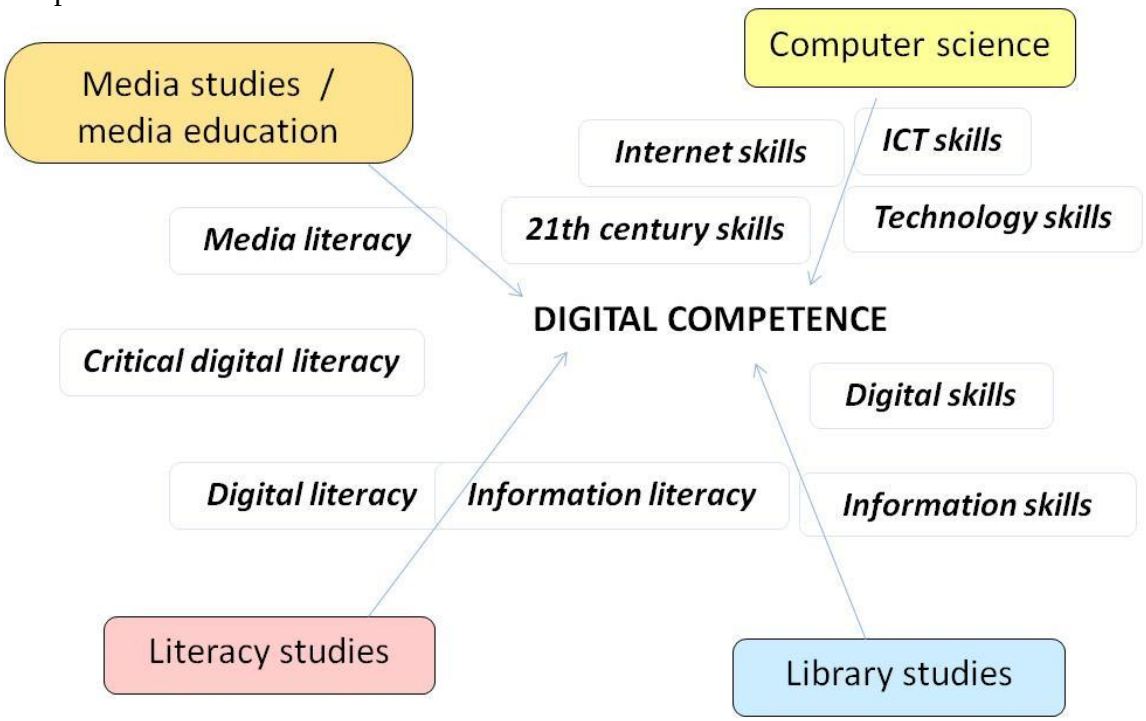


Fig. 1 Digital competence, background disciplines and related concepts

Digital competence and its connection to general competences

OECD launched a project (The OECD Program Definition and Selection of Competencies, 2005) which provides a framework for guiding the longer-term extension of assessments into new competency domains[3]. In the project, the key competencies for a successful life and a well-functioning society are classified in three broad categories:
1) Use tools interactively,
2) Interact in heterogeneous groups, and
3) Act autonomously.

Each of these key competencies implies the mobilization of knowledge, cognitive and practical skills, as well as social and behavioural components including attitudes, emotions, values, and motivations. The underlying part of the framework is reflective thought and action. Thinking reflectively demands relatively complex mental processes and requires the subject of thought process to become its object; reflectiveness implies the use of metacognitive skills, creative abilities and taking a critical stance.

The first key competence, Use tools interactively, is close to digital competences. It means the ability to use technology with other people for communication, for working, for playing etc., which requires an awareness of new ways in which an individual can use technologies in his/her daily life. An individual should have the ability to make use of the potential of ICT to transfer

[3] The framework is connected to and used in OECD Pisa studies.

the way of working, to access information, and to interact with others. In the report, the key competence is divided to the following sub-competencies:
1) Use language, symbols and texts interactively: the effective use of spoken and written language skills, computation and mathematical skills, in multiple situations.
2) Use knowledge and information interactively: requires to
- recognise and determine what is not known
- identify, locate and access appropriate information sources
- evaluate the quality, appropriateness and value of that information, as well as its sources; and
- organise knowledge and information
3) Use technology interactively requires awareness of new ways in which individuals can use technologies in their daily life; to use the potential of ICT to transform the ways of working together, accessing information and interacting with each other. We have to go beyond the basic technical skills that are needed only to use the Internet, send e-mails and so on.

European Union (2010) (see also Ala-Mutka, Punie, Redecker, 2008) has created a framework for key competences for lifelong learning in a knowledge society, in which eight key competences are identified and defined. These are
1. communication in the mother tongue;
2. communication in foreign languages;
3. mathematical competence and basic competences in science and technology;
4. digital competence;
5. learning to learn;
6. social and civic competences;
7. sense of initiative and entrepreneurship;
8. cultural awareness and expression.

These competences are not defined, but, shortly presented in a chapter, for the digital competence new technology for schools is needed to ensure basic ICT skills as part of digital competence. In addition, besides basic ICT skills, such aspects as critical thinking in the use of new technologies and media, risk awareness, and ethical and legal considerations have received less attention, and these issues should be explicitly addressed in teaching and learning. The potential of new technologies for enhancing innovation and creativity, new partnerships and for personalising learning needs to be better exploited.

Investigating digital competence

One reason for the missing definition of digital competence is the limited amount of studies that measure the digital competence (or digital skills). As van Deursen and van Dijik (2009) note, the studies are often limited in their definitions, sample sizes and methods of data collection. This means that there is not enough empirical data to validate the structures and the content of digital competences or skills.

van Deursen and van Dijk (2009) summarised the research concerning skills (and they called it *'Internet skills'*) and they presented the multiple research directions as a succession of directions (which can also be regarded as a succession of competence):
1. The first direction copes with *the operation of digital media* (so-called 'button knowledge'). This direction is close to the operationalisation of the European Computer Driving Licence (ECDL), see http://www.ecdl.com/publisher/index.jsp
2. The second direction relates to *the specific medium used* and covers the formal structures on which this medium is built; e.g., Internet offers hyperlinks.

3. The third direction covers *the content provided by digital media* and focuses on information search behaviour. In the studies of this direction information skills and information literacy are strongly related; van Deursen and van Dijk connected this to the widely used definition of the American Library Association (ALA) about an information literate person who is "able to recognize when information is needed and has the ability to locate, evaluate and use the needed information effectively" (referred to Correia and Teixeira, 2003).
4. The fourth direction considers *the personal goals and benefits for using digital media*. These are strategic skills, which appear to be most complex of all types of digital skills, and, as van Deursen and van Dijk say, have never been measured at all.

(The authors conducted an interesting study based on this taxonomy in the Netherlands, measuring with test all these four types of Internet skills.)

Practical work for defining necessary digital competencies

There appears to be a common and wide interest in trying to define the necessary competencies for the future; various institutions, consortia and national policy makers have projects aiming to define the competences either in a general sense or for a chosen group, such as teachers or students. See, e.g., the following sources:

- UNESCO (2010) has a project about ICT Competency Standards for Teachers. The competencies consist of four components: Policy and vision, Technology literacy, Knowledge deepening, and Knowledge creation, and each of them, several topics.
- International Society for Technology in Education has defined the educational technology standards for students (ISTE, 2007). The main competencies are creativity and innovation; communication and collaboration; research and information fluency; critical thinking, problem solving, and decision making; digital citizenship, and technology operations and concepts.
- The Assessment and Teaching of 21st Century Skills project (ATC21, 2009) was created by Cisco, Intel and Microsoft and launched 2009 (the project is still going on and the paper referred is a draft). In this project, the focus was in the new ways and methods for assessment and teaching. The skills in the paper (referred as 21st century skills) were grouped to four main categories listed in Table 1.

Table 1. The main categories of 21st skills, based on The Assessment and Teaching of 21st Century Skills –project

I Ways of Thinking	II Ways of Working	III Tools for Working	IV Living in the World
1. Creativity and innovation	4. Communication	6. Information literacy	8. Citizenship – local and global
2. Critical thinking, problem solving, decision making	5. Collaboration (teamwork)	7. ICT literacy	9. Life and career
3. Learning to learn, Metacognition			10. Personal & social responsibility – including cultural awareness and competence

'Tools for working' was the group which mainly focused on digital skills.

Summary

As a summary, the concept *digital competence* is an emerging concept and related to the development of technology as well as the political aims and expectations for citizenship in a knowledge society. It consists of a variety of skills and competences, and its scope is on several areas: media and communication, technology and computing, literacy, and information science. Digital competence consists of 1) technical skills to use digital technologies, 2) abilities to use digital technologies in a meaningful way for working, studying and for everyday life in general in various activities, and 3) abilities to critically evaluate the digital technologies, and 4) motivation to participate in the digital culture. Digital competence is regarded as a core competence in policy papers; in research, however, it is not yet a standardized concept. Several policy- or practice-related projects are currently working for finding a common and acceptable definition.

3. Method for answering the question

Elaborating the question

The question *What is digital competence?* was formulated based on several authentic questions, which focused on questions about the content of the technology-related skills. (The authentic questions included questions like "What is the core of technological competence: basics with which you can get by in ever changing supply?" and "Should digital competence be distinguished from other life competences?") After defining the main question, the following sub-questions were used to consider various aspects for the answer:

- What does it consist of?
- What is the relation to general competences?

Preliminary framing for the answer was discussed, and it was formulated as follows:

- Define digital competence
- Go through those digital competences that are considered most crucial
- Define the relationship between digital and general competence
  - Are they related?
  - Do they support each other?
- Address the matter of the change of the field

It was clear that for such a new phenomenon as digital competence, empiric-based peer-reviewed research papers are not yet available, and the concept has to be considered based on various policy-related papers, such as papers by OECD, EU and UNESCO. It was decided to use these papers, reports and decisions for defining the concept and to use empirical research papers for diversifying the answer.

Search procedures

The search was conducted in EBSCOhost which is an on-line retrieval system on educational, psychologican and behavioural science databases. The databases used for this project were Academic Search Complete and Education Research Complete. The search was narrowed down by restricting the results with the following limitations: Articles were to be peer-reviewed, full-text was to be available via EBSCOhost, with the rights purchased by the

University of Helsinki, the language of the publication was to be English and finally the article was to be published between January 2005 and June 2010. (Originally the time period was from January 2000 to June 2010, but this produced too many hits, the relevance of which was usually minimal.)

The following search words were used for the databases, where the term indicated between the parentheses describes to which parts of the database the search words were directed:

Search words used for general searches, which produced results for digital competence related answers in general:

- digital competence* (all text)
- digital skill* (all text)
- digital literac* (all text) AND education (subject terms) AND school (subject terms)
- ICT skill* (all text) AND education (subject terms) AND school (subject terms)
- ICT competenc* (all text) AND education (subject terms) AND school (subject terms)
- ICT literac* (all text) AND education (subject terms) AND school (subject terms)

Search words used for especially this answers:

- digital literac* (all text) and definition (subject terms)
- ICT skill* (all text) and definition (subject terms)
- ICT competenc* (all text) and definition (subject terms)
- ICT literac* (all text) and definition (subject terms)
- digital competenc* (all text) AND defin* (all text)

In addition to the searches conducted in the EBSCOhost databases, a manual search was conducted on the latest issues of journals available to the researchers listed in the Appendix. The authors used also other peer-reviewed journal articles, which they found relevant for the theme. The researchers were familiar with these articles from previous encounters with the field, and some of the articles were also found via the references of the articles found in the searches.

The policy-related papers related to this theme were searched from the Internet using knowledge acquired by reading related scientific articles. Finally the authors also asked some suggestions from experts on the theme to ensure the build of a strong knowledge base to write the answer on.

In all, 20 research papers and 8 policy papers or other non-empirical papers and reports were used for writing the answer.

4. References

ATC21. Draft White Papers (2009). The Assessment and Teaching of 21st Century Skills project. Unpublished manuscript.

Adeyemon, E. (2009). Integrating digital literacies into outreach services for underserved youth populations. *Reference Librarian, 50*(1), 85-98.

Ala-Mutka, K., Punie, Y., & Redecker, C. (2008). Digital competence for Lifelong Learning. Luxemburg: Office for Official Publications of the European Communities. Retrieved August 20, 2010 from http://ftp.jrc.es/EURdoc/JRC48708.TN.pdf

Aviram, R. & Eshet-Alkalai, Y. (2006). Towards a theory of digital literacy: three scenarios for the next steps. *European Journal of Open Distance E-Learning.* Retrieved August 20, 2010 from http://www.eurodl.org/materials/contrib/2006/Aharon_Aviram.htm

Carrington, V. (2005). The Uncanny, Digital Texts and Literacy. *Language and Education*, 19, 467–482.

van Deursen, A. J. A. M., & van Dijk, J. A. G. M. (2009). Using the internet: Skill related problems in users' online behavior. *Interacting with Computers, 21*(5), 393–402.

van Dijk, J. & Hacker, K. (2003). The Digital Divide as a Complex and Dynamic Phenomenon. *The Information Society*, *19*, 315–326.

Erstad, O. (2005). Digital kompetanse i skolen (Digital literacy in the school). Oslo: University Press.

Erstad, O. (2006). A new direction? Digital literacy, student participation and curriculum reform in Norway. *Education & Information Technologies, 11,* 415–429.

Erstad, O. (2010). Educating the Digital Generation. *Nordic Journal of Digital Literacy*, 1, 56–70.

Eshet-Alkalai, Y., & Chajut, E. (2009). Changes over time in digital literacy. *CyberPsychology & Behavior, 12*(6), 713-715.

Eshet-Alkali, Y., & Amichai-Hamburger, Y. (2004). Experiments in digital literacy. *CyberPsychology & Behavior, 7*(4), 421–429.

European Union (2010). 2010 joint progress report of the Council and the Commission on the implementation of the 'Education and Training 2010 work programme'. *Official Journal of the European Union,* (2010/C 117/01) Retrieved August, 22, 2010 from http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:C:2010:117:0001:0007:EN:PDF

Hague, C. & Williamson, B. (2009). Digital participation, digital literacy and school subjects. A review of the politicies, literature and evidence. Retrieved September 10, 2010, from http://www.futurelab,.org.uk/resources/documents/lit_reviews/DigitalParticipation.pdf

ISTE (= International Society for Technology in Education) (2007). *Profines for Technology (ICT) Literate Students.* Retrieved August 24, 2010, from http://www.iste.org/Content/NavigationMenu/NETS/ForStudents/2007Standards/NETS-S_2007_Student_Profiles.pdf

Jenkins, H., Clinton, K., Purushotma, P., Robinson, AJ., & Weigel, M, (2006). Confronting the Challenges of Participatory Culture: Media Education for the 21st Century, the John D and Catherine T MacArthur Foundation. Retrieved August 10, 2010, from http://www.digitallearning.macfound.org/atf/cf/%7B7E45C7E0-A3E0-4B89-AC9C-E807E1B0AE4E%7D/JENKINS_WHITE_PAPER.PDF

Jones-Kavalier, B., & Flannigan, S. L. (2008). Connecting the digital dots: Literacy of the 21st century. *Teacher Librarian*, *35*(3), 13-16.

Krumsvik, R. (2008). Situated learning and teachers' digital competence. *Education & Information Technologies*, 13(4), 279-290.

Leu, D., Kinzer, C., Coiro, J., and Cammack, D. (2004). Toward a Theory of New Literacies Emerging From the Internet and Other Information and Communication Technologies. In R. Ruddell and N. Unrau (Eds), *Theoretical Models and Processes of Reading. Fifth Edition* (pp. 1570-1613).Newark, USA: International Reading Association.

Merchant, G. (2007). Writing the future in the digital age. *Literacy*, 41, 118–128.

Norris, P. (2001). *Digital Divide? Civic Engagement, Information Poverty & the Internet in Democratic Societies.* New York: Cambridge Press.

Punie, Y. (2007). Learning Spaces: an ICT-enabled model of future learning in the Knowledge-based Society. *European Journal of Education*, 42, 185–199.

Punie, Y. & Cabrera, M. (Eds.) (2006). *The Future of ICT and Learning in the Knowledge Society.* Luxembourg: European Commission.

Sefton-Green, J., Nixon, H., & Erstad, O. (2009). Reviewing approaches and perspectives on "Digital literacy". *Pedagogies, 4*(2), 107-125.

OECD (2005). The OECD Program Definition and Selection of Competencies (2005). *The definition and selection of key competencies.* Executive summary. 30. June, 2005. Retrieved August 10, 2010, from http://www.oecd.org/dataoecd/47/61/35070367.pdf

OECD (2010). *Are the New Millenium Learners Making the Grade?*Technology use and educational performance in PISA. Centre for Educational Research and Innovation.

Twist, J. & Withers, K. (2007).The challenge of new digital literacies and the 'hidden curriculum'. *Emerging Technologies for Learning*. Vol 2, 27–39.

UNESCO (2008). Competency Standards Modules. ICT Competency Standards for Teachers. United Nations Educational, Scientific and Cultural Organisation. Retrieved August 26, 2010, from http://cst.unesco-ci.org/sites/projects/cst/The%20Standards/ICT-CST-Competency%20Standards%20Modules.pdf