Today's Two Important Skills: Digital Literacy and Critical Thinking

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1 Introduction

Digital literacy of students and their skills to use the new technologies effectively and efficiently both for their learning and their future career is the concern of our age since the fast and vast information makes people adapt themselves to continuously changing life (Sharkey & Brandt, 2008; Shopova, 2014). In other words, as Halpern (2003) states, it is important among wide variety of information to choose, interpret and evaluate the necessary and relevant information and she also puts emphasis on knowing how to learn and think critically. Critical thinking helps people find the relevant and correct information on a specific subject (Cottrell, 2005). Therefore, digital literacy and critical thinking are two vital skills for the twenty first century (Halpern, 2003). Furthermore, Kong (2014) notes that these twenty-first century skills should be mastered for the success in the life. Therefore, schools should train students in order to support them to keep up with the changes in the digital world through using the critical thinking skills. Although Halpern (2003) discusses how and which part of critical thinking skills can be taught, she summarizes some studies about critical thinking skills which are learnt at school and then used in different settings. She suggests that "Critical thinking instruction needs to focus overtly and self-consciously on the improvement of thinking, and the learning experience needs to include multiple examples across domains in order to maximize transfer" (p. 13). Similarly, Cottrell (2005) and Paul and Elder (2014) note that critical thinking can be developed through practice or changing behaviours and learning how to deal with the emotional barriers. Paul and Elder (2014) make a good analogy between the intellectual and physical improvement. Both of them entail a great deal of practice.

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To sum up, in the present study these two crucial skills of twenty first century (digital literacy and the skills of critical thinking) will be discussed and their effects on education will be elaborated. Some previous studies will be summarized with their suggestions and implications.

2 Digital Literacy

Under the concept of digital literacy, other associated terms should be identified such as information literacy (Hobbs, 2010; UNESCO, 2008; Welsh & Wright, 2010) and media literacy (Bevort & Breda, 2008; Boyd, 2016; Linuma, 2016) in order to show the similarities and consistency between them as they are one part of the same family (Hobbs, 2010). Also, while discussing the most important skills in the digital age, the notions "digital literacy or technological literacy or computer literacy" are used interchangeably but in this study digital literacy will be employed.

According to the report of The European Parliament and the Council of the EU (2006), there should exist eight key competences for lifelong learning and "Digital competence" is one of them. Digital competence (literacy) is defined as "the ability to use computers, social media, and the Internet" (Hobbs, 2010, p.17). Definition of digital literacy is elaborated in the report of The European Parliament and the Council of the EU (2006) as in the following "Skills needed include the ability to search, collect and process information and use it in a critical and systematic way, assessing relevance and distinguishing the real from the virtual while recognising the links. Individuals should have skills to use tools to produce, present and understand complex information and the ability to access, search and use internet-based services" (p.16). On the other hand, Sharkey and Brandt (2008) note that the skills and the knowledge that digital literacy involves depend on the people or the settings. For example; in K-12, students need to use internet to seek information about the school subjects, use presentation programs (Hobbs, 2010) and educators need to use technological tools for classroom practices and teaching supplements (Hall et al., 2014); adults should have the ability to use digital tools for work, leisure and communication (The European Parliament & the Council of the EU, 2006, p. 15).

3 Information Literacy (IL)

The term information literacy (IL) refers to "how to access information in digital formats and how to evaluate information and use it appropriately" (Welsh & Wright, 2010, p.1). In short, it comprises seeking information, retrieving and using it (Hobbs, 2010; Sharkey & Brandt, 2008). This is a vital skill for lifelong learning and knowledge societies and it is regarded as a basic human right by UNESCO. The person who is information literate has the capacity to do the following (UNESCO, 2008, p. 12).

a. Recognise information needs
b. Locate and evaluate the quality of information
c. Store and Retrieve information
d. Make effective and ethical use of information, and
e. Apply information to create and communicate knowledge.

This skill is related to problem solving and communication skills and it in turn helps people to be competent in their life. Therefore, studies on information literacy including these five elements are carried out not only in schools but in higher education as it is considered as an important skill since cognitive skills, particularly critical thinking, are required while creating and using new knowledge (UNESCO, 2008).

As it is proposed by Linuma (2016), "Our world is being transformed by knowledge building culture in which people collaborate, organize and build information using the internet" (p. 18). Therefore, students should be trained to become information literate as this new world with full of vast and fast information requires people to be engaged knowledge builders.

Sharkey and Brandt (2008) emphasize that technological and information literacy skills are two important skills and they complete one another. Thus, the term "information technology literacy" is used in some places. Acquiring these two skills allow people to adapt to the changing world for the continued lifelong learning.

4 Media Literacy

Hobbs (2010) describes media literacy as "associated with critical analysis of news, advertising and mass media entertainment" (p. 17) and it includes "television and film, radio and recorded music, print media, the Internet and all other new digital communication technologies" (p. 50).

As stated by Boyd (2016), students can reach information very quickly and easily through various search engines, databases or YouTube channels. Similarly, Linuma (2016) points out "Today, users can experiment easily with video editing, digital publishing as well as digital art creation. Participatory media, such as blogs, wikis, video blogs, and social network services are also being used to foster various interactions both inside and outside classrooms" (p. 18). Thus, learners interact with each other both inside and outside the school through these channels and they create and share new knowledge. It is a necessity to learn how to use the technology and the information to generate new knowledge. Linuma, (2016, p. 19) exemplifies necessary skills for just one area, video creation and streaming, in the media literacy skills as in the following (Table 1).

Using digital media and its tools effectively and appropriately is not easy. It consists of many skills or competencies, which are showed in Fig. 1. The competencies help people in lifelong learning while they consuming or producing knowledge through the Internet (Hobbs, 2010). Similarly, Sharkey and Brandt (2008) note that digital and information literacy skills can be acquired as basic digital skills such

Table 1 Participatory media skills and literacies

	Productive "writing" skill	Receptive "reading" skills
Participatory media literacies	Multimedia authoring, e.g., images, moving images, writing	Searching and reading
		Navigating and reading
		Linking and sharing
	Digital publishing, e.g., images, moving images, writing	Multimedia interpretation and enjoyment, e.g., video contents, audio contents
	Video creation	Assessing credibility of information
	Audio creation	

Fig. 1 Essential competencies of Digital and Media Literacy (Hobbs, 2010, p. 18)

as finding information using the internet and writing a paper or as high-level information skills such as seeking the various sources, assessing them through critical thinking and in turn accepting or rejecting the idea.

Bevort and Breda (2008) add that "Information technology is not simply an "object" of knowledge. Familiarity and a certain level of skill are required" (p. 141). In other words, students should be trained and observed. They recommend that there is a great necessity for the media teaching in the schools, particularly for the new media. However, lack of both equipment in the schools and teachers' digital media competency are regarded as the restrictions.

Besides digital, information and media literacy training, it is stated that training also "requires a critical and reflective attitude towards available information and a responsible use of the interactive media" in the report of The European Parliament and the Council of the EU (2006, p. 16). Therefore, not only digital or information literacy skills but critical thinking skills should be covered in this study.

5 The Skills of Critical Thinking

Critical thinking is a broad and complex term but a comprehensive definition is proposed by Halpern (2003, p. 6) as in the following.

> Critical thinking is the use of those cognitive skills or strategies that increase the probability of a desirable outcome. It is used to describe thinking that is purposeful, reasoned, and goal directed—the kind of thinking involved in solving problems, formulating inferences, calculating likelihoods, and making decisions, when the thinker is using skills that are thoughtful and effective for the particular context and type of thinking task.

Cottrell (2005) emphasizes that critical thinking consists of various skills and attitudes and it is directly related to reasoning which means the analysis of the situation and reaching a conclusion. Therefore, problem-solving and effective communication are other skills (Paul & Elder, 2014).

Thinking critically has been important but it is much more important in twenty-first century as the world is constantly changing technically and it, in turn, is becoming more complex with a great deal of information. Therefore, people can come across novel problems at their workplace and they should be ready for lifelong learning and for using the information efficiently (Halpern, 2003).

According to Halpern (2003, pp. 14–15), the characteristics of critical thinker will

- Recognize semantic slanting and guilt by association.
- Seek out contradictory evidence.
- Use the metacognitive knowledge that allows novices to monitor their own performance and to decide when additional help is needed.
- Make risk: benefit assessments.
- Generate a reasoned method for selecting among several possible courses of actions.
- Give reasons for choices as well as varying the style and amount of detail in explanations depending on who is receiving the information.
- Recall relevant information when it is needed.
- Use skills for learning new techniques efficiently and relating new knowledge to information that was previously learned.
- Use numerical information including the ability to think probabilistically and express thoughts numerically.
- Understand basic research principles.
- Demonstrate an advanced ability to read and write complex prose.
- Present a coherent and persuasive argument on a controversial, contemporary topic.
- Provide complex instructions in language that is appropriate for the audience.
- Use matrices and other diagrams for communication.
- Synthesize information from a variety of sources.
- Determine credibility and use this information in formulating and communicating decisions.

Based on the Delphi panel carried out by Facione (1990), 6 cognitive skills and their various sub-skills of these skills are stated: "Skill 1. Interpretation and it covers categorization, decoding significance, and clarifying meaning. Skill 2. Analysis covers examining ideas, detecting arguments, and analysing arguments into their component elements. Skill 3. Evaluation covers assessing claims and assessing arguments. Skill 4. Inference covers querying evidence, conjecturing alternatives, and drawing conclusions. Skill 5. Explanation covers stating results, justifying procedures, and presenting arguments. Skill 6. Self-regulation covers self-examination and self-correction" (p. 5–6) and the California Critical Thinking Dispositions Inventory (CCTDI) is used to measure the characteristics of critical thinking (Goldberg et al. 2015).

There are many advantages of being a critical thinker and these are listed as follows: "improved attention and observation, more focused reading, improved ability to identify the key points in a text or other message rather than becoming distracted by less important material, improved ability to respond to the appropriate points in a message, knowledge of how to get your own point across more easily, skills of analysis that you can choose to apply in a variety of situations (Cottrell, 2005, p. 4).

As a conclusion, in order to train students, digital and information literacy skills and critical thinking should be used together while incorporating technology with critical thinking into the classes. Sharkey and Brandt (2008) exemplify a few classes in Purdue University. For example, in English literature class students are required to analyse a text critically and present it as a final project. They can use various sources (photos, journals, music, etc.) to support their ideas.

6 Studies About Training Students and Teachers in Terms of Digital Literacy and Critical Thinking Skills

As Hinrichsen and Coombs (2013) point out, there is a necessity for both integration of technology into curriculum and integration of curriculum into technology because they draw our attention to the students who are digitally competent but not critically competent. Similarly, Talib (2018) notes the fact that students do not have critical and technical digital competency. Thus, digital literacy pedagogy helps students understand, adapt and use the digital tools, which are a part of their lives. For this reason, they emphasize both using devices and software in the curriculum and practices in each step of curriculum design. Additionally, Waddell and Clariza (2018) put emphasis on digital literacy training of students but they express their concern about how critical pedagogy in the development of digital literacy can be integrated into curriculum. By answering the following questions, curriculum designers and teachers can plan it step by step in the curriculum "How do different technologies allow us to make different kinds of critical interventions in our classrooms or professional practice? How does the use of technology enable (or hinder) these interventions? How

Table 2 Studies about digital literacy training with critical thinking across the world

Research	Country	Participants
Bevort and Breda (2008)	Europe and Canada	12–18-year-olds
Hall et al. (2014)	Leicester, The UK	Secondary school teachers
Kong (2014)	Hong Kong	Secondary school students
Porat et al. (2018)	Israel	Secondary school students
Saxena et al. (2018)	India	Dental students
List (2019)	The USA	Pre-service teachers
Purnama et al. (2021)	Indonesia	Elementary school students
Setiawardani et al. (2021)	Indonesia	Higher education
Shopova (2014)	Bulgaria	Higher education
Techataweewan and Prasertsin (2018)	Thailand	Undergraduate students

does the effective use of technology for instruction vary in different organizational, cultural, and social contexts?" (p. 232).

As it is stated above, teachers decide on the teaching–learning process by means of the critical approach because students should be trained how they will deal with the vast and fast information on the internet, which is digital literacy. However, instructors sometimes are lack of digital literacy. Therefore, not only students but teachers also should be trained (Boyd, 2016). In the following, Table 2 demonstrates the studies which were carried out in different countries with different age groups. Each of them will be summarized below.

Firstly, studies about students' digital literacy skills will be discussed as they are regarded as digital natives and they can access the internet whenever they want. However, they might be the victims of cyber world due to the lack of their digital literacy skills. Therefore, supervision of parents and teachers is a must and they should provide support to develop their digital literacy skills with critical thinking (Purnama et al., 2021). Thus, training students in digital literacy skills is of great concern to today's societies. In the following, studies with different age groups in different countries will be summarized.

Shopova (2014) examined sixty students' use of information and communication technologies (ICT) at the South-West University in Bulgaria. Results showed that development of digital literacy of students and their skills in ICT must be the centre of education, which helps students to achieve better performance and keep up with the rapidly changing social, economic and cultural life.

In the study of Kong (2014), it was aimed to help secondary school students in Hong Kong to develop both information literacy and critical thinking skills in the created digital classrooms. It was an experimental study conducted during 13 weeks. Results showed that students had significant development in their domain knowledge, information literacy competence and critical thinking skills.

Bevort and Breda (2008) discussed the use of digital media by 9000 young people (12 to 18- year -olds) in Europe and Canada. Results demonstrated that students widely use the internet outside the school. This implies that schools do not train the young people about the use of internet. They learn how to use it individually. So, they cannot receive necessary digital skills at school. They also suggest that some necessary regulations on the prohibition of the use of digital media in the schools should be taken into consideration. Through training and intervention, students' digital literacy skills and critical thinking skills can be developed.

Purnama et al. (2021) conducted a study with elementary school students in Indonesia in order to examine the relationship between digital literacy skills and students' online risks, self-control or parental mediation. Students' digital literacy skills and parental mediation promote their self-control. This implies that children who have low digital literacy skills might be the victims of internet-based crimes. On the other hand, if they have high digital literacy skills, these students can secure themselves online or minimize internet-based crimes. Thus, the relationship between digital literacy skills and online risks is correlated positively. Finally, parental mediation cannot explain their self-control.

Setiawardani et al. (2021) investigated the futuristic pedagogical competencies that enhance the digital literacy of students in Indonesia in the digital age. The sample is selected randomly in this study to measure the literacy abilities of students in the University of Education of Indonesia. Findings demonstrated that developing digital literacy of students is influenced by the implementation of a critical pedagogic model.

Porat et al. (2018) aimed to examine the digital literacy skills of secondary school students and to compare between students' self-assessment of their literacy level and their actual performance of digital assignments. They collected data from 280 Israel junior-high school students in 2016 and analysed with Pearson correlation method through SPSS software. The results demonstrated that students had significant confidence on the rated digital skills while their actual performance was lower.

Techataweewan and Prasertsin (2018), who examined the definition, practices and elements of digital literacy to improve the quality of learning for undergraduate students in Thailand, analysed the gathered data from 1.183 undergraduate students in 14 universities with the confirmatory factor analysis (CFA) approach. According to the findings, digital literacy criteria for students comprised of four factors: operation skills, thinking skills, collaboration skills and awareness skill.

Saxena et al. (2018), who proposed to examine digital literacy and smartphone use, focus on the 260 Central Indian dental students. Analysing the collected data with SPSS software, the findings revealed that dental students wanted to adopt the digital age in the education process and suggested educators and policy makers to

change their education methods. In addition, the findings provided an opportunity for students to improve their current learning methods.

All these studies examined the students' digital literacy skills but teachers' digital literacy skills, attitudes or perceptions should also be taken into consideration as Hobbs (2010) notes that teachers might be reluctant to use the instructional practices. They might not use technological tools effectively or they might not have time to develop students' digital literacy competency while they are dealing with teaching for high-stakes tests. Therefore, Hall et al. (2014) summarized the results of a project which aimed to create holistic and integrated change on secondary school teachers in Leicester while supporting them in the process of transforming their digital literacy into classroom. The results showed that cooperative work should be integrated. Also, social and ethical problems should be taken into consideration while integrating technology into classroom practices. Similarly, List (2019) investigated the beliefs of 188 pre-service teachers in the USA about digital literacy as they will be the teachers who will implement digital literacy skills with critical thinking in their future classes. According to the findings of the study, participants shared the same beliefs as in the literature, which are related to the conceptions of digital literacy development: an automatic process (digital natives), skills-based and sociocultural perspectives. Furthermore, they also focused on additional conceptions of digital literacy: autonomous learning, access to technological tools, project-based, lack of digital literacy. Additionally, most of the participants mentioned that they developed their digital literacy skills in a formal setting and they note that they develop these skills in elementary school more than middle and high schools.

After discussing the studies conducted across the world about digital literacy and critical thinking, similar studies carried out in Turkey are illustrated in Table 3 and will be summarized in the following part.

The study of Ata and Yıldırım (2019) aimed to find out 295 pre-service teachers' perceptions of digital literacy through both quantitative and qualitative data. Findings showed that they had positive perceptions to use the digital tools appropriately and effectively.

Akayoğlu et al. (2020) conducted a study with pre-service EFL teachers to reveal their digital literacy which helps them to think critically while using technological tools or platforms. 113 students participated in this qualitative study. Findings showed

Table 3 Studies about digital literacy training with critical thinking in Turkey

Research	Country	Participants
Akayoğlu et al. (2020)	Turkey	Turkish pre-service EFL teachers
Ata and Yıldırım (2019)	Turkey	Turkish pre-service EFL teachers
Ayyildiz et al. (2021)	Turkey	Turkish academics and prospective teachers in faculties of education
Erol and Aydin (2021)	Turkey	Turkish language teachers in public schools
Gökdaş and Çam (2022)	Turkey	Science teachers

that these pre- service teachers believed that they were digital literate enough to use the digital tools and platforms.

Ayyildiz et al. (2021) revealed the views of Turkish academics and the prospective teachers in faculties of education. Two data collection tools were used: the "Academician's Digitalization Scale" for the academics and the "Students' Perception Scale about Instructors' Technology Integration Competence" for students. Data were analysed by SPSS 24 and AMOS 24 software programs. Department and age of academics had a statistically significant effect on the digitalization of academics while gender of prospective teachers affects their ideas.

Apart from studies conducted at universities, the following two studies covered the teachers who worked in public school. In other words, they were in-service teachers and their views and digital literacy level were examined.

Erol and Aydin (2021) examined digital literacy of 188 Turkish language teachers through the Digital Literacy Scale and analysed the data via SPSS 21 software. According to the results, the digital literacy level of Turkish language teachers was high, but it decreased when they get older. Besides age, their experience, their daily use of technology and internet, and using distance education and social media affected their digital literacy level. However, their gender did not have a statistically significant effect on their digital literacy level.

Gökdaş and Çam (2022) investigated the level of digital literacy of 88 science teachers during the distance education via both a scale and an interview form. Gender did not affect their digital literacy level whereas experience affected it negatively. That is, when work experience increased, digital literacy level decreased.

7 Conclusion

In recent years, the most important skills of digital age, which are digital literacy and critical thinking skills have been examined by many researchers but studies above are just a few out of numerous examples which examine the digital literacy through critical thinking. Besides these studies, here are some suggestions about the instructional practices to develop students' digital literacy with critical thinking skills: "Keeping a media-use diary, using information search and evaluation strategies, reading, viewing, listening and discussing, close analysis, cross-media comparison, gaming, simulation and role playing, multimedia composition" (Hobbs, 2010, p. 23). Furthermore, software programs and web-based tools can be used such as word processor, presentation programs, blogs or wikis. This helps the teachers to address the different needs of learners. Also, it is a shift from teacher-centred class to learner- centred class, which implies students are active learners by means of the technology use. In this type of learning, following strategies might be used: reciprocal teaching, cooperative learning, project-based learning, strategy instruction, inquiry-based learning (Brooks-Young, 2007).

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