

## Technology Literacy According to Students: What is It, Where are We and What Should We Do for Parents and Children?

### Öğrencilerin Gözüyle Teknoloji Okuryazarlığı: Nedir, Neredeyiz, Aile ve Çocuklar İçin Neler Yapmalı?

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#### Abstract

Nowadays, there is a swift transformation in Information and Communications Technology (ICT) and all technological devices and tools affect our lives both on an individual and societal level with their innovations. Especially such technological devices as computers, mobile phones and tablet PCs require us to know how to use these technologies efficiently, therefore aiming to make their use and the lives of individuals and societies much easier. In this view, the concept of technology literacy comes to the prominence. In this study designed qualitatively, the opinions of 25 students from the Department of Computer Education and Instructional Technologies about the term 'technological literacy' are collected. A definition is made using these concepts while students define technological literacy as becoming aware and following, ability to use, problem solving and benefiting from its use in social life. In addition to that, students stated negative opinions about the society in which they live. They stated that there is an unconscious and purposeless or limited technology use even though the use of technology differs to a great extent in terms of age. Students also made a recommendation for parents and children to get education on technology, to acquire further information and to keep a close track on technology.

**Keywords:** *Technology literacy; literacy; technology; society and technology; use of technology*

#### Özet

Günümüzde ICT'lerde hızlı bir dönüşüm yaşanmakta, yenilik olarak karşımıza çıkan teknolojik araçlar ve ürünler bireysel ve toplumsal olarak yaşamı etkilemektedir. Özellikle bilgisayar, cep telefonu, tablet PC gibi çoğu teknolojik araç, bu teknolojilerin etkin bilinmesini, kullanımını ve bu sayede bireylerin ve toplumun yaşamının kolaylaştırılmasını amaçlamaktadır. Bu kapsamda teknoloji okuryazarlığı kavramı ön plana çıkmaktadır. Bu araştırmada nitel olarak desenlenen bu araştırmada 25 bilgisayar öğretmenliği bölümü öğrencisinin görüşleri ile teknoloji okuryazarlığı kavramı ele alınmıştır. Öğrenciler teknoloji okuryazarlığını teknolojiden haberdar olma ve takip etme, kullanabilme, problem çözme ve sosyal yaşamda yararlanabilme boyutları ile değerlendirmiş, bu değerlendirmelerden yola çıkılarak da bir tanıma ulaşılmıştır. Ayrıca öğrencilerin, içinde yaşadıkları toplumu olumsuz biçimde değerlendirdiği sonucu dikkat çekmiştir. Daha çok bilinçsiz ve amaçsız ya da sınırlı düzeyde bir teknoloji kullanımının var olduğu, buna karşın yaşa göre kullanımın farklılaştığı değerlendirilmesinde bulunmuşlardır. Öğrenciler ailelere ve çocuklara yönelik teknolojiler konusunda eğitim alma ve bilgilendirilmenin, ayrıca teknolojinin yakından takip edilmesinin önemini dile getirmişlerdir.

**Anahtar Kelimeler:** *Teknoloji okuryazarlığı; okuryazarlık; teknoloji; teknoloji ve toplum; teknoloji kullanımı*

## Introduction

The traditional definition of literacy, which introduces us the most efficient way of composing data, acquiring and delivering it to others starting from centuries before, includes the coding and decoding of expressions via using an alphabet (Longman 2003). According to this, people must know how to use coding in their expressions via using an alphabet and get meanings from these coded expressions in order to claim that they are traditionally literate.

When the term 'literacy' is examined out of its traditional meaning, Kress (2003) defined it as "the ability to use communicative images made meaningful by the society in an effective way." This definition means that people benefit from communication images made meaningful by the society instead of alphabets. Potter (2005) emphasized that literacy has no certain alphabet and any phenomenon can easily replace the role of an alphabet, besides changing these phenomena in time.

The social change we experience, new technologies and applications we have both change the meaning of many terms and give us new terms every day. The term 'literacy' is also seen to be one of these most affected and diversified terms in this view. Hence, it is now possible to provide tens of types and definitions on literacy following the most up-to-date studies in the literature. It is often possible to see such terms as media literacy, cultural literacy, computer literacy, information literacy, science literacy and medical literacy in our present literature. Therefore, it would be pertinent to claim that technology literacy that we examine in our study has a wide framework in terms of its scope.

Before starting to examine the term 'technology literacy', it would be educatory to investigate the term 'technology' separately. Volti (2006) describes technology as 'a system that uses knowledge and organization to produce objects and techniques for the attainment of specific roles'. According to Web (2003), the definition of technology changes in which context it is dealt with. For example, when technology is regarded as an object, it refers to tools, devices and machines, but when it is regarded as an activity, it refers to skills, methods and applications.

Depending on the term 'technology', the term 'technology literacy' may also be regarded in various contexts. Therefore, it is preferable to define it under general terms. For example, Hansen (2003) defines technology literacy as 'an individual's abilities to adopt, adapt, invent, and evaluate technology to positively affect his or her life, community and environment'. Eisenberg and Johnson (2002) suggest the definition as 'the ability to use technology for making organizations, conducting research or solving problems'. An individual must know what technology is, how it is processed, how it shapes societies and how societies shape it in order to mention about technology literacy. An individual with technology literacy must be objective and comfortable when utilizing from technology and must regard the social effects of technology (ITEA, 2000).

According to the report published by International Technology Education Association (ITEA, 2000), technology literacy can be attained by the learners by the help of education. Of course, this situation requires that instructors must be more competent technology-literate individuals when compared to learners. However, nowadays a common presupposition is that learners start experiencing technology at a younger age every day, therefore becoming more efficient technology-literate individuals than their instructors. As seen, the need in this view and related presuppositions require investigating technology literacy with scientific research studies.

## Literature review

In the literature, it is possible to see several studies under such headlines as information literacy, computer literacy, digital literacy and Internet literacy, all of which can be evaluated under one common term 'technology literacy'. However, it is seen that the studies that directly dealt with technology literacy are limited.

As a result of the study, conducted by Link and Marz (2006) with the data gathered from 1116 first-year students in Medical University of Vienna, the results indicated that large population of students had sufficient skills to use computers and Internet effectively. Moreover, it is also seen in the results that

gender plays a significant role in technology literacy, but having a limited relation with it. Researchers stated that age and former use amounts of information technologies created distinct differences rather than gender.

Another important study on technology literacy is conducted by Judson (2010). Judson gathered data from 5000 fifth and sixth grade and 5000 seventh and eighth grade students and investigated whether an identifiable link existed between gains in technology literacy and achievement in the areas of reading, mathematics, and language arts. The results indicated that technology literacy contributed to both creating a specific trust into learning processes and led to new environments for further learning opportunities.

Alkali and Hamburger (2004) conducted a study in relation to technology to investigate photo-visual, reproduction, branching, information and socio-emotional skills of 60 participants between ages 17 and 40. As a result of this experimental study, the findings indicated that young participants are more successful in photo-visual and branching literacy tasks than older ones, but old participants are more successful in reproduction and information literacy tasks than young ones.

Another study on technology literacy was conducted by Hill and Heard (2010). In this study conducted with 5109 eighth-grade students, the students were involved in an education program acquired over a website called learning.com starting from the first day of that education year. As a result of the study, it is seen that the seventh-grade students who often used technology both at school and at home till the end of that year performed an achievement on expert level in technological applications.

It is believed that the studies on technology literacy, the important examples of which in the literature are stated above, did not have a sufficient amount of update and variety compared to the importance of this field. This study is conducted to investigate the viewpoints of candidate teachers of computer on technology literacy, who will be responsible from guiding technology in our near future to fulfill the needs in this view.

### **The Aim of the Research**

The main purpose of this study is to determine the opinions of students in the Department of CEIT on technology literacy. Questions below are tried to be answered in that sense:

1. What are the opinions of students on technology literacy?
2. How do the students evaluate the society in which they live in terms of technology literacy?
3. What recommendations do the students make for parents and children to increase technology literacy?

### **Method**

The research model, participants, data collection tools and data analysis method are indicated below.

#### **Research Model**

This qualitative study is conducted to determine the opinions of students on technology literacy and designed in phenomenological method. Phenomenological method is a qualitative research method aiming to indicate experiences, perception and significance of individuals on a specific phenomenon (Yıldırım and Simsek, 2006).

#### **Participants**

The participants involved 25 students (16 Male, 9 Female) between ages 19 and 22, taking an optional course named 'Scientific Literacy' in the Department of Computer Education and Instructional Technologies (CEIT) in a university in Turkey during 2013-2014 education year. Due to the fact that

both they are candidate teachers and students in this department; all of them are believed to have a high awareness in terms of technology literacy.

### Data Collection

25 students from the Department of CEIT, who selected the optional course of literacy, are interviewed in order to determine the opinions of candidate teachers in terms of technology literacy. A semi-structured interview form is prepared for this purpose by the researchers. Each student is interviewed for seven or eight minutes.

### Data Analysis

There are two different methods in qualitative data analysis, which are content analysis and descriptive analysis. Descriptive analysis is mostly preferred in studies with a theoretical background on a theoretical sense, but content analysis is used in studies with no clear theme in hand on a theoretical base (Yıldırım and Simsek, 2006; Yin, 1984). Content analysis method is used in this study as no framework is underlined on a theoretical base in terms of technology literacy. For content analysis, each step required for an accurate content analysis is closely followed from processing the data gathered from students into indexes, preparing codes from these indexes, organizing themes using these codes, describing these themes after organizing them and interpreting the findings according to these themes (Yıldırım and Simsek, 2006).

The important part of qualitative data analysis is the reliability of data. The analyses of two researchers are compared for the reliability of data in data coding, preparing themes using these codes and describing these themes. The inter-coder reliability of this study is calculated as 92% using the formula  $\text{Consensus} / (\text{Dissensus} + \text{Consensus}) * 100$  by Miles and Huberman (1994).

## Findings

The findings related to the opinions of students on technology literacy, their evaluations of society in which they live in terms of technology literacy and their recommendations made for parents and children in order to increase technology literacy are given in titles below.

### Opinions of students on technology literacy

25 students in the study are asked 'What is technology literacy?'. 54 responses in total gathered from the students for this question are organized under five main themes (Table 1).

Table 1. Technology Literacy According to Students

	f	%
Skills to benefit from technology	15	27.7
Problem Solving/Productivity	13	24.2
Being aware of technology	11	20.4
Following technological devices	9	16.6
Requirement of a social life	6	11.1
Total	54	100

As seen in Table 1, students responded as a skill to benefit from technology for the term 'technology literacy' mostly (15 times – 27.7%). In other words, it indicates that technology must be usable for technology-literate individuals. For instance, a technology-literate individual should be able to use a mobile phone according to his/her needs. On the other hand, problem solving/productivity is stated in the second stage (13 times – 24.2%). For instance, a technology-literate individual should be able to use the Internet connection in his/her mobile phone to purchase a travel ticket. Being aware of technology (11 times – 20.4%) and following technological devices (9 times – 16.6%) are the other themes obtained. Here, knowing what can be done using a mobile phone and knowing which new features are added to the newest models of mobile phones by technology-literate individuals can be

given as an example to other themes. Finally, the last theme is gathered as 'requirement of a social life' (6 times – 11.1%). In this view, such technologies as computers and mobile phones should be used by each individuals from doctors to teachers.

Examples for most-frequently obtained themes in students' responses are indicated below:

'Skills to benefit from technology' theme

*"The most accurate and beneficial use of technology in all parts of our lives." (21 - M)*

'Problem Solving/Productivity' theme

*"...Creating new ideas for problematic areas and helping the solving process." (20-F)*

'Being aware of / Knowing technology' theme

*"...The world is developing each day, therefore increasing the use of technological products. For me, technology literacy refers to what you can do using technology and knowing about them." (19-M)*

### **Literacy levels of society in which they live according to students**

Students are asked how they evaluate the society they live in in terms of the subgoals of this study. There are 28 items collected in total as a result of the responses given for this question and those expressions are organized under 4 main themes (Table 2).

Table 2. Literacy levels of society in which they live according to students

	f	%
Only technical use and limited understanding	14	50.0
Purposeless/unconscious use	9	32.1
Intergenerational differences	3	10.7
Developing/sufficient	2	7.2
Total	28	100

It is also remarkable that most of the students have negative opinions about the society in which they live in terms of technology literacy (Table 2). However, two of the students stated that there is sufficient development or still developing. It is seen that the students evaluated the society in which they live only as technical use and limited understanding (50%), purposeless and unconscious use (32.1%), intergenerational differences (10.7%) and developing/sufficient (7.2%) in terms of technology literacy.

Example expressions are given below including the themes organized in terms of students' opinions about the society in which they live.

Only technical use and limited understanding

*"... We have a settled technology today. However, most of us are not aware of what they can do even though they have all of this technology available to us. They only think on a one-dimensional viewpoint, disregarding how they can use it and what they can do with it." (21-F)*

Purposeless and unconscious use

*"...People do not know that they can use technology in many areas and they can easily finish their work in a short time. There is an unconscious use." (20-M)*

Intergenerational differences

*"...Age is an important factor. For instance, an old man goes to a bank to pay his bills, but a young individual, who is much closer to technology, easily finishes his/her work using the Internet." (20-M)*

### **Recommendations for parents and children made by students to increase technology literacy**

Students are asked to make recommendations for parents and children to increase technology awareness and the findings obtained are given in Table 3.

Table 3. Recommendations for parents and children made by students to increase technology literacy

		f	%
<b>For Parents</b>	Guiding children	16	51.6
	Supervising children	7	22.6
	Following the technology under development	5	16.1
	Training/Getting information	3	9.7
	Total	31	100
<b>For Children</b>	Acquisition of skills for conscious use	16	66.7
	Acquisition of skills for making research	6	25.0
	Acquisition of habit to follow technology	2	8.33
Total		24	100

There are 31 recommendations in total under four main titles in terms of parents and 24 recommendations under three main titles in terms of children, made by 25 students who are trained on technology literacy.

When the recommendations for parents are examined, it is seen that they involve guiding children (51.6%), supervising children (22.6%), following the technology under development (16.1%) and training/getting information in this field (9.7%).

Example expressions are given below about the recommendations made by students in terms of parents.

Guiding children

*"...Parents should never restrict children to reach technology and should find the necessary materials by themselves to assist them. They should use it together and they should guide them." (22-M)*

Supervising children

*"...Parents should monitor their children when using technology. So, they can easily take precautions against any misuse or incomplete use." (21-M)*

Following the technology under development

*"...I strongly recommend that individuals must continuously use the technology to make a positive contribution to their children." (21-F)*

The same students also made recommendations in order to increase the technology literacy levels of children, given respectively as acquisition of skills for conscious use (66.7%), acquisition of skills for making research (25%) and acquisition of habit to follow technology (8.33%). The expressions stated by the students in terms of children are exemplified below.

Acquisition of skills for conscious use

*"...They should relate them to their courses at school and increase their ability to use it in real life." (22-M)*

Acquisition of skills for making research

*"...Children should learn such useful skills as how to use technological devices and tools and how to search the things for which they are curious" (20-F)*

Acquisition of habit to follow technology

*"...We should let children know how they can use the technology and to what extent it is useful for them." (21-M)*

### Conclusions and Discussion

The importance of technology use increased especially by the swift development of Information and Communication Technologies (ICTs) and the popularization of technological devices. Many actions such as being aware of technology, keeping a close track on the newest models, knowing how to use them effectively and solving our daily problems via these technologies have all become a routine in our lives.

However, Altun (2005:11) states that a society which do not utilize from new technology in its daily life will eventually affect its own objectives about social life of its people and will come to a point not to realize this fact, instead of shaping it via responding the social objectives of these tools. All these issues are taken into consideration under the term 'technology literacy'. The opinions of 25 candidate teachers of CEIT department are gathered in terms of technology literacy, which is believed to have a high level of technology literacy in this view and the results are given below.

Students bring such issues on technology literacy into the prominence respectively as skills to benefit from technology, problem solving/productivity, being aware of technology, following technological devices and requirement of a social life. Using the themes obtained from students' expressions, technology literacy can be defined as "being aware of technology and following technological devices, using these technologies by all people within a society both effectively and productively to solve problems."

It is possible to argue that there is an ICT-digital focused viewpoint in students' opinions due to their department (CEIT). Becta (2010) defines digital literacy as "the combination of skills, knowledge and understanding that young people need to learn in order to participate fully and safely in an unceasingly digital world", and states that digital literacy involves four dimensions, which are functional technology skills, critical thinking, collaborative skills and social awareness. These dimensions closely correspond to the opinions of students.

On the other hand, all these expressions point out the term 'information literacy', which also involves technology literacy in addition to many other literacy types. McClure (2001) stated that the intersecting point of all literacy types such as media literacy, network literacy, visual literacy, technological literacy and computer literacy, all of which resulted from technological advancement. Doyle (1994: 2-3) stated that an individual with information literacy should possess the above mentioned main characteristics besides the use of information technologies, reaching sources, organizing data for further applications, problem solving and social interaction dimensions. Therefore, the findings are in parallel to information technology, which is accepted as common ground for all literacy types.

Students, in general, made a negative evaluation about the society in which they live in terms of technology literacy. They especially stated that it is used under a technical or limited framework or used without conscious. When the data published by State Planning Organization (SPO) (2006:23) are examined, it is remarkable that the levels of utilizing from technological devices by the public are quite low. In the same framework with this plan, it is also remarkable that there are three recommendations made to increase these data, which are common (technological) access, higher motivation and focused competence (ability to use). The intergenerational differences are the outcome of digital transformation experienced nowadays. Prensky (2001) stated that there are two societies living together, one is defined as digital immigrants and the other as digital locals; adding that digital locals are more competent to use technology and new generation uses technology much better than its parents (digital immigrants). Therefore, age is an important factor in technology use and it is an important result that students underlined it as a distinctive element.

All recommendations made by the students for parents and children involve education and awareness raising activities in terms of positive use of technology. Becta (2010) emphasizes the importance of education to increase literacy. However, the findings indicating that technology literacy will be increased by the acquisition of research skills especially designed for students are also significant. Doyle (2004) also stated that literacy is increased by the development of research skills in his study where he dealt with literacy within the framework of information technology.

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