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## Visiting digital fluency for pre-service teachers in Turkey

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### Abstract

The technology advances rapidly; as a result, education and instruction are getting digitalized. So it could be estimated that; pre-service teachers who are future teachers, should have digital skills. This is the main point of this study which aims to visit pre-service teachers in Turkey from the perspective of digital fluency, give insights about digital fluency, scrutinize its difference from digital literacy and provide literature review on the previous studies about digital fluency. At first, the connection between digital fluency and the 21st century analyzed, then the differences between digital literacy and digital fluency are described. Worldwide and specifically Turkish literature review revealed that, certain studies foresaw the increasing importance of digital fluency based on development of digital devices, and Turkish literature was limited to some scale development and descriptive studies solely determining the digital literacy level of the participants. Thus, it could be stated that further and up-to-date studies are required, which would be conducted with pre-service teachers and current assessment instruments should be developed to determine digital fluency level, considering the rapid advances in technology.

Keywords: digital fluency, digital literacy, pre-service teachers.

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## 1. 21st Century Skills: Inspiration of Digital Literacy to Digital Fluency

Changes in the 21st century conditions have been affecting the learners' understanding and learning skills directly or indirectly. It has been also been affecting the technological tools and methods that learners use. These developments require the utilization of 'digital skills', which are mostly attributed to changes in society, and more particularly, to the rapid development of technology and its impact on the way we live, work and learn (Voogt & Roblin, 2010). Various frameworks that define the '21st century skills' have been defined by different institutions. For example, The Metiri Group and North Central Regional Educational Laboratory (NCREL) (2003), set 'EnGauge Framework' that comprises digital-age literacy, inventive thinking, effective communication and high productivity. Also, International Society for Technology in Education (ISTE) introduced "International Society for Technology in Education Information and Communication Technology (ICT) Skills" framework in 2007, which includes arguments such as; creativity and innovation, communication and collaboration, research and information fluency, critical thinking, problem solving, and decision making, digital citizenship, technology operations and concepts.

Apart from all these organizations, Partnership for 21st Century Skills (2011) revised P21 framework that includes core subjects that refer to global awareness, financial, economic, business and entrepreneurial literacy, civic literacy, health literacy, environmental literacy, learning and innovation skills, information, media and technology skills, life and career skills.

Thus, 21st century skills have been identified in literature using different concepts. However, it can be argued that there is one common point about the digital skills, and that is of all the digital skills 'digital fluency' comes to the fore. In order to understand digital fluency, this is useful to define digital literacy and digital competence concepts that have been evolved in the evolution process.

The most basic definition of literacy is defined as a condition to read and write a text using the alphabet (Reinking, 1998). Lanham (1995) claims that literacy is the ability to understand information however presented. Thus, according to Gilst (1997) digital literacy is "the ability to understand and use information in multiple formats from a wide variety of sources when it is presented via computers."

Digital literacy is beyond these definitions. It also includes reading instructions from graphical interfaces (photo-visual literacy), utilizing digital reproduction in learning (reproduction literacy), constructing knowledge from non-linear navigation (lateral literacy), and evaluating information (Eshet, 2004). Therefore, the content should be viewed from a wide perspective. Thus, Lankshear & Knobel (2005) expressed the interaction-oriented content as follows: "Digital literacy involves interacting with information, and interacting with information is about assessing its truth (or validity), credibility, reliability and so on." This perspective gives a hint on ethics as well.

Due to the active involvement of concerned elements in the process of knowledge construction, recently the concept of competence has been considered as more appropriate with respect to literacy (Cartelli & Maillet, 2008). According to Ferrari (2012), "Digital competence is the set of knowledge, skills, attitudes 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." Also Ala-Mutka (2011) points that being digitally competent should mean having sufficient skills and capability to be efficient with digital processes and devices.

Tornero (2004) states that digital literacy merges capabilities: purely technical aspects, intellectual competences and also competences related to responsible citizenship. These all allow individuals to advance themselves completely in an information society. Besides, digital competence entails being able to explore and face new technological situations in a flexible way, to analyze, to select and critically evaluate data and information, to exploit technological potentials in order to represent and

solve problems and to build shared and collaborative knowledge, while fostering awareness of one's own personal responsibilities and the respect of reciprocal rights/obligations (Calvani, Cartelli, Fini & Ranieri, 2008).

Yet, with the recent advances in technology and its use in our lives and education systems, ideas underlying concepts and definitions of digital literacy and digital competence have turned out to be limited to some extent.



Figure 1. Three phases of digital skills

As a consequence, a new concept called digital fluency has emerged and has been discussed in the literature. Accordingly; digital fluency is a problem solving ability, which necessitates obtaining information using Internet, contextualise, visualise and synthesise in an effective and technologically creative way. Also this ability enables a person to use technology applications to explore –real life problems and to develop digital media artifacts or any other electronic expressions. Digital fluency includes understanding complex issues such as how identity is faked and subtext of the digital information to place it in a wider context (Hsi, Pinkard & Woolsey, 2005; Bologna, Sabau & Bologna 2009; Resnick, Alder, Hagan, Richardson, Croce & Cohn, 2009; Bartlett & Miller, 2011; Savin-Baden, 2015).

Digital fluency differs from the concept of digital competency because of the level of use. Fluency in English language means using the language for any task or objective so digital fluency means not only being able to use digital technology also knowing how to construct ideas of significance with digital technology (Resnick, 2002; Ala-Mutka, 2011).

In order to understand the characteristics and critical importance of digital fluency among 21st century skills, we first need to focus on its differences from other digital skills especially digital literacy. The differences between digital fluency and digital literacy can be clarified with an example of hammer and woods:

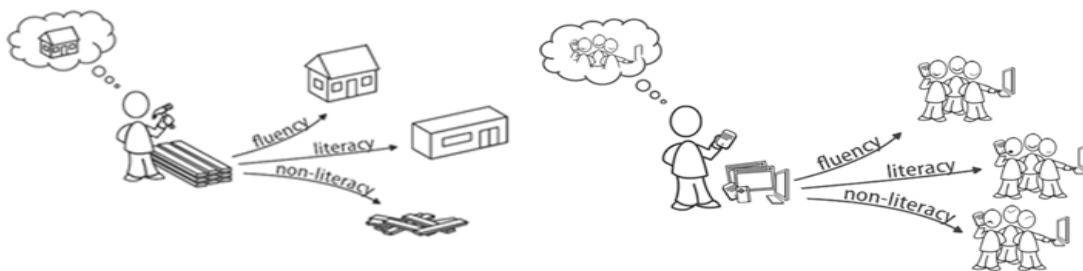


Figure 2. Digital literacy and digital fluency (Briggs & Makice, 2011)

In Figure 2 can be seen a man who has already planned and aimed to construct a house using the tools he has. For an non-literate person, these materials are nothing but pieces of woods and he doesn't know what he can do and how he can accomplish it. On the other hand, a literate person has managed to build a structure by making use of the materials and tools he has. However, this is not the same house with what he has planned and aimed to build. Only with digital fluency, yet, a person can create the desired house by the use of ideal materials, tools and techniques.

The hammer and woods case is similar with the skills of using digital technologies so as to obtain positive and desired outcomes and effects on people, things and situations. Briggs & Makice (2011) unveils these crucial aspects in his blog post titled “The Difference Between Digital Literacy and Digital Fluency”:

Literacy and fluency have to do with our ability to use a technology to achieve a desired outcome in a situation using the technologies that are available to us. It applies to our ability to use digital technologies to have the intended positive effect on people and situations. Digitally literate people are perfectly capable of using the tools. They know **how** to use them and **what** to do with them, but the outcome is less likely to match their intention. It is not until that person reaches a level of fluency, however, that they are comfortable with **when** to use the tools to achieve the desired outcome, and even **why** the tools they are using are likely to have the desired outcome at all.

Sainz, Castano & Artal (2008) similarly claim that the concept of digital literacy is not accurate enough to express the process of adaptation of a person to new technological advancements and changes. In their study, they claimed that “digital fluency comprises a complex variety of cognitive, digital and social skills activated in order to achieve digital-related goals and adapt to different technological media, their properties and to their continuous shifts and advancements.” They also add that “this conception recognizes the synergy between the individual and the technology and the adaptive capacity of the individual to manage and survive in a digital environment. A person who is technologically fluent is capable of using previous knowledge and technological experience to learn new strategies to adapt to possible changes in that technology.”

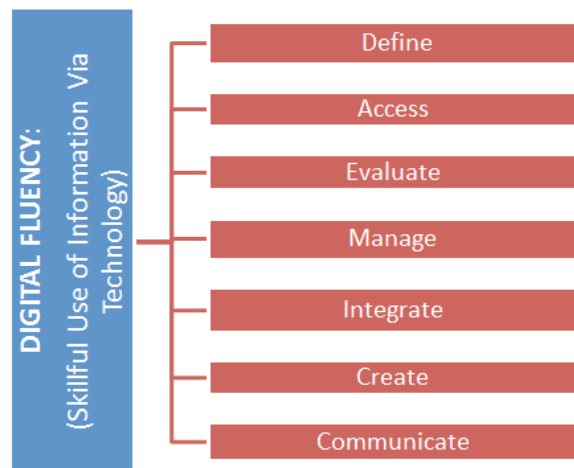


Figure 3. Skillful Use of Digital Fluency (Educational Testing Service, 2011)

After many different definitions and explanations made on the characteristics of a digital fluency, the figure above summarises “the skillful use of information via technology” that a digitally fluent person should be equipped with and be able to fulfil.

As the literature review demonstrates, digital fluency is a new skill that should be acquired by the inhabitants of the digital age so as to keep up with the dazzling changes of this century. Resnick (2002) stressed the importance of being digitally fluent in today’s world, and emphasized that “In the years ahead, digital fluency will become a prerequisite for obtaining jobs, participating meaningfully in society, and learning throughout a lifetime. Students would need to be fluent online, with the web, text, audio, animation, video, remixing, design, downloading and uploading, and fluent in critical thinking, collaboration and deciding relevancy”. Therefore, in order to raise digitally fluent generations and to help them to catch up with the upcoming technological enhancements of the new era, it is crucial to start this evaluation using education and instruction. It’s obvious that teachers are the

centrepieces of education. Thus, in higher education institutions teacher candidates must be nurtured with necessary skills for being digitally fluent educators so that they can transpose these skills to their students in their classes after graduation.

## **2. Digital Fluency for Pre-service Teachers: Reflections from Turkish Literature**

Pre-service teachers' digital fluency is not considered as a skill to be acquired by education, but a personal trait. Educational Faculties' curriculum all over the world heavily focus on instructional methods and techniques. It appears that the new generation of pre-service teachers is increasingly knowledgeable about and skilled in the use of ICT. As a priority, these future teachers seem to attract their students' interests and are not only willing to try different methods of ICT in their classes but also seek opportunities to do so (Martinovic & Zang, 2012).

In the UNESCO (2008) document of ICT Competency Standards for Teachers (2008), it has been stated that: "Traditional educational practices no longer provide prospective teachers with all the necessary skills for teaching students to survive economically in today's workplace". In this document, UNESCO recommends that pre-service teachers should develop their technology literacy.

2009 PISA report addressed the importance of teacher training as "those who have the responsibility to teach the New Millennium Learners have to be able to guide them in their educational journey through digital media. Teacher training, both initial and in-service, is crucial for the dissemination of this key message as well as to equip teachers with the required competences" (OECD 2009).

Contrary to the developments in the world, digital fluency was not scrutinized much in the literature of Turkey. This can be anticipated since digital fluency is a relatively new concept for Turkey, whereas information literacy and digital literacy are topics that many studies have been conducted on.

Literature review on digital literacy and information literacy in Turkish reveals the following studies:

Askar & Umay (2001) developed "Perceived Computer Self-efficacy Scale" and applied this scale on students in the Elementary Mathematics Education program. The findings showed that perceived self-efficacy levels of the students were not high, which according to their answers to the questionnaire, stemmed from the students' lack of access to personal computers or their infrequent use. Based on this finding, it was concluded that students were inexperienced in computer use and they mostly used it for browsing the Internet, online chat and gaming purposes.

Akkoyunlu & Kurbanoglu (2003) conducted a study to determine information literacy self-efficacy of pre-service teachers. The sample consisted of undergraduate students attending Elementary Science Education, Elementary Mathematics Education and Computer Education and Instructional Technologies (CEIT) programs. Perceived Computer Self-efficacy Scale developed by Askar & Umay (2001) and Information Literacy Self-efficacy Scale developed by the researchers themselves were used for data collection. The findings of the study suggested that students of CEIT program displayed higher scores on both perceived computer self-efficacy and information literacy self-efficacy, which could have been expected since their curriculum required high proficiency in information literacy. From 1st grade to 4th, perceived computer self-efficacy and information literacy increased respectively regardless of the program.

Akkoyunlu & Orhan (2003) developed a scale for self-efficacy perception on computer usage for pre-service teachers who were in the CEIT program and applied this scale to CEIT pre-service teachers attending various universities in Turkey. The most prominent finding of this study was that perception on computer usage for pre-service teachers were higher for elder students. According to the researchers' interpretations of the findings, this was a result of the fact that elder students were more experienced.

Kıyıcı (2008) developed a scale for his doctoral dissertation titled “Determination of digital literacy level of pre-service teachers”. This study aimed to determine digital literacy levels of pre-service teachers and whether there was a significant difference between the variables of gender, computer ownership, Internet access, the program they study and their income level. The findings of the study demonstrated that each of these variables resulted in a significant difference on digital literacy. These findings were consistent with the prior studies in Turkish literature.

Digital Empowerment scale which consisted of awareness, motivation, technical access and empowerment factors was developed for university students (Akkoyunlu, Soylu & Çağlar, 2010). Pre-service teachers in 4th grade of Faculty of Education participated in the developing process of the scale. It was a 7 point likert scale and aimed to determine the level of digital empowerment of the undergraduate students based on each factor. Then, this scale was used to collect data from 113 Elementary School teachers in a following study (Akkoyunlu & Soylu, 2010). Results indicated that; teachers displayed medium level digital empowerment and Information Technology teachers got the highest scores. This research also showed that teachers who are over 45 years old scored the highest in both awareness and motivation.

### 3. Discussion

One of the crucial points to consider today is, that the digital world is focusing into the “Internet of things” driven by digital media and devices (O’Keeffe, 2014). However, today’s most popular products and services may disappear within a decade due to the fast-changing social and technical realities (Meyers, Erickson & Small, 2013). Within this context, education and instruction are becoming increasingly digitalized. Within the course of the rapid technological developments, the next generation will be educated in a more digital world. It is important, thus, for pre-service teachers to have high level of digital fluency. Besides, it is common sense to argue that digital skills and competences expected from future teachers will be more than the current teachers.

In this digital era, it is vital to raise students as individuals who are digitally fluent and digitally skilled. Community life and the quality of life will increase accordingly as we rise digitally fluent generations. At this point in time, it is crucial to enhance teachers’ levels of digital fluency in accordance with the current developments. It is also necessary to maintain teachers’ level of digital fluency by continuous in-service training, which holds an important role in professional development of teachers.

In order to prepare students for life-long learning and the work environment, we have to adopt the emerging technologies, trends and approaches. We should consider to the skills, which we demand to teach to the students while we develop our curriculum to adapt the new era. There is a great challenge for students. Students will work in the jobs, which is not invented now. We should try to prepare and equip students with the skills, which must be valid in the future.

Due to the new economic challenges, entrepreneurship is more important than ever before. Innovative thinking, creativity and awareness of opportunity are some of the key concepts of entrepreneurship. We want our students to be entrepreneur and make new works, which can be competed on global level. Students should be digitally fluent to track the new developments in the world, to express the innovative ideas, to establish start-up and to reach goals.

One of the major challenges of the digital age is to equip students with some high-order skills such as creativity, innovation, communication, collaboration, critical thinking and problem solving. Along with the increasing access to technological devices, the number of digitally literate students has also been increasing. However, the number of digitally fluent students is still not considered sufficient. The world is going to continue to increasingly require all the people and especially students to become powerful online and digital savvy in critical thinking, creativity, communication, and collaboration

skills. More applications and regulations, thus, should be looked for to capture and acquire this emerging and essential skill (ETS, 2011).

Finally, educational settings should be designed to accommodate the learning processes that develop students' levels of digital fluency (Olsson & Edman-Stalbrant, 2008). In order to equip the students with these high-order skills, the need to initially measure and improve the level of digital fluency levels of the students are necessary, and that can only be achieved with the digitally fluent teachers.

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