Digital Literacy, Competence, Identity and Intelligence: The Four Teachers Essential Skills in 21st Century

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ARTICLE INFORMATION	ABSTRACT
	These days, digital literacy, digital competence, digital identity and digital intelligence are becoming essential skills for everyone, especially teachers. Understanding their concepts and components is essential for teachers even more than learners in the process of these digital skills development. If teachers have not capabilities in these four skills, they couldn't transfer any knowledge to learners in online environments undoubtedly. Even proper, on time, enough and complete knowledge transfer from teachers to leaners never happened. The results of this study show that teachers had low awareness about 4D skills and couldn't understand and define 4D skills very well. The present qualitative study measured teachers' awareness about these digital skills by semi-structured interviews and based on the retrieved data, proposed a Quality 4D (digital literacy, digital competence, digital intelligence) skills framework for measuring and developing of teachers 4D skills.

1. Introduction

These 4D skills were put aside in the past, but now these are considered core competencies and are necessary for succussing in most career, especially teaching. For this reason, these digital skills are important parts of a comprehensive educational framework. Such a framework provides the best digital knowledge transfer for online learning environments. Most teachers challenge this challenge these days because they never go beyond these 4D skills surface level. Teachers should try hard to improve their 4D skills if transferring digital knowledge in the best way is a basic goal. These 4D skills are highly learnable and improvable. According to Oxbrow (2000), hierarchies have been broken and networked organizations have developed in the twenty-first century.

Besides a considerable amount of literature on twenty-first century digital skills and their development in the last decade, there is no unified set of digital skills. While it is generally believed that digital technologies can empower teachers and learners to foster the development of twenty-first-century skills, the evidence to support these beliefs is still limited (Ng, 2015). First of all, teachers with these 4D skills can design pedagogically sound learning activities for their students. As these 4D skills are transformable across digital platforms and applications, teachers can integrate digital technology under most circumstances. As it is often the case that several software packages could do the same task, teachers need to critically select the most appropriate ones for use to achieve the targeted learning goals (Ng, 2015). When teachers feel confident and comfortable using technology, they will assist with their learners' problems, such as technical issues, without too much effort and hence will not be distracted from the core duties of teaching. They are able to reduce their cognitive load and increase the germane (intrinsically motivating) load of their learners' learning through the preparation of engaging and relevant activities (Ng, 2015).

1.1 Research problem

Although 4D skills are very important for teachers in both their profession and life, they do not know these 4D skills. It is the responsibility of education department and researchers that provide conditions for improving these 4D skills and enough new content about them. Unfortunately, there is a gap about the understanding of these 4D and their definitions by teachers.

1.2 Objectives of the study

This study aims to clarify the meanings and definitions of 4D skills for better understanding of them and measuring teachers 4D skills through the Quality 4D framework parts proposed by researchers. This framework is designed for developing and measuring teachers 4D skills.

1.3 Research Questions

The researchers proposed these questions based on the objects of this paper:

RQ1: What digital literacy, competence, identity and intelligence entail for teachers?
RQ2: How much digital literacy, competence, identity and intelligence skills improvement are important in teachers' jobs and lives?

2. Review of literature

2.1 Digital literacy

These days and rapid digitalization, different terms such as ICT literacy, information technology literacy, digital literacy, technology literacy, media literacy, information literacy, net literacy, online literacy and new literacies are mentioned in literature. Hague and Payton (2010, p. 2) defined digital literacy as follow:

> Digital literacy is an important entitlement for all young people in an increasingly digital culture. It furnishes children and young people with the skills, knowledge and understanding that will help them to take a full and active part in social, cultural, economic, civic and intellectual life now and in the future...To be digitally literate is to have access to a broad range of practices and cultural resources that you are able to apply to digital tools. It is the ability to make and share meaning in different modes and formats; to create, collaborate, and communicate effectively and understand how and when digital technologies can best support these processes.

> European Information Society (Martin, 2005, p. 135) proposed another definition for digital literacy:

> Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyze and synthesize digital resources, construct new knowledge, create media expressions, and communicate with others, in the context of specific life situations, in order to enable constructive social action; and to reflect upon this process.

Spires and Bartlett (2012) digital literacy taxonomy and Froutanian (2021) digital literacy curriculum components, digital literacy is made of seven skills as:

Technical Skills: Applying digital tools.

Civic Skills: Using digital tools in a best way.

Communicative Skills: Using digital communication protocols for sharing idea in a best way.

Collaborative Skills: Applying suitable digital platforms and tools to producing, evaluating and sharing digital contents.

Computational Thinking Skills: Applying critical thinking skills by digital tools for gathering, analyzing of data and information.

Investigative Skills: Digital resources searching, identifying and validating.

Productive Skills: using digital tools for producing contents.

These skills include technical, cognitive and social–emotional dimensions of Ng (2015) digital literacy framework. It means that digital literate persons should have all the above skills and developments of digital literacy are ongoing. First of all, skills and competences developed for special usage, then applied and finally, critical thinking turn.
    Martin and Grudziecki (2006) said that:

> the individual identifies a competence requirement. He/she may then acquire the needed digital competence through whatever learning process is available and preferred. He/she can then make appropriate use of the

acquired digital competence. The informed uses of digital competence within life-situations are termed here as digital usages. These involve using digital tools to seek, find and process information and then to develop a product or solution addressing the task or problem. This outcome will itself be the trigger for further action in the life context.

Developments of digital literacy would be the best way to achieve digital competencies for teachers because they can help their learners develop the skills and knowledge needed to use educational technologies effectively and prepare digitally based curriculum materials that integrate these skills and knowledge into the learners' learning.

2.2 Digital competence

By the development of digital tools in education, a lot of definitions were proposed for digital competence. 'Digital competences means integrated and functional use of digital knowledge, skills and attitudes' (Aesaert et al 2013). European Parliament and the Council (2006) defined digital competence as follow:

> Digital competence involves the confident and critical use of Information Society Technology (IST) for work, leisure and communication. It is underpinned by basic skills in ICT: the use of computers to retrieve, assess, store, produce, present and exchange information, and to communicate and participate in collaborative networks via the Internet.

Based on Janssen et al. (2013) view, digital competence composed of twelve different competencies such as General knowledge and functional skills, use in everyday life, specialized and advanced competence for work and creative expression, technology-mediated communication and collaboration, information processing and management, privacy and security, legal and ethical aspects, balanced attitude towards technology, understanding and awareness of the role of ICT in society, learning about and with digital technologies, informed decisions on appropriate digital technologies, Seamless use demonstrating self-efficacy (See figure 1). Their model shows that all digital competence areas are related to each other and also made clear that how different competencies build digital competence as a whole. In education, teachers need a high level of digital competence more than the other, and digital competence is a very complicated subject in the teaching profession. By considering Janssen et al. (2013) competence model, it is revealed that by acquiring these competencies, teachers will be digital literate.
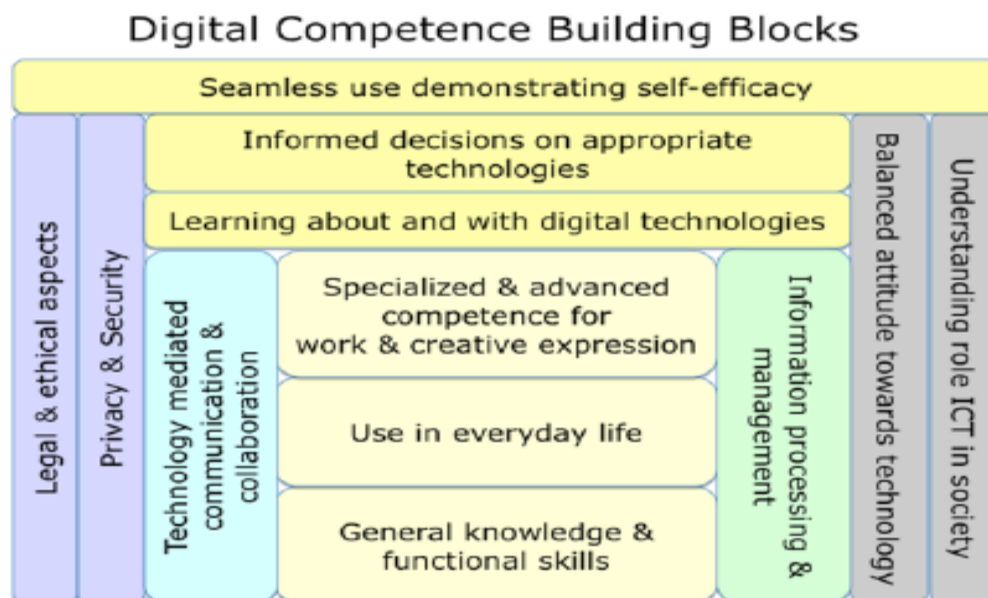
Figure 1. Digital competence areas (Janssen et al. 2013)

2.3. Digital identity

Ng (2015) stated that digital identity means self-practice and self-images produced through digital media engagement. He believes the practices of performing a coherent, ethical, and engaged identity are relational with others and produced in others' context in ways that only become obvious when we start to critique, understand, and embrace digitality as part of our everyday cultural practices and our everyday lives. Lankshear, Knobel and Machet (2002) stated that digital media require high literacy

levels compared to textual literacy that is digital identity. Digital identity is the pictures that individuals create from themself for the online world. In different areas of our life, such as personal, learning and work, digital literacy can be helpful. A variety of techniques are applicable to these fields with any limitation. The result of individuals integration with technology are traces that were left by their activities. These digital traces maybe are in the form of digital resources that they shared. These traces are their digital identity and based on this, it is approvable that the teachers' traces which are the results of their integration with technology, make their digital identity. When teachers achieve competences in Janssen et al. (2013) digital competence, they can create a digital identity for themselves.

2.4 Digital intelligence
DQ Institute defined digital intelligence as "the sum of the social, emotional and cognitive skills that enable people to meet the challenges and demands of digital life and will become vital for developing the digital skills and digital profiles that this century demands ". By considering this definition, it can be measurable and improve during time. Digital intelligence has three levels as digital citizenship, digital creativity and digital entrepreneurship (See figure 2).

Figure 2. Basic skills of digital intelligence based on DQ Institute (2017)

3. Method
This study follows a qualitative research design. It identifies teachers' understanding of 4Dskills and explores the importance of 4D skills improvement through teachers' jobs and lives. All participants responded to two open-ended questions via semi-structured interview. The responses were analyzed qualitatively.

3.1 Participants
The participants of this study comprised teachers. A total of 175 participants (101males, 74females) were recruited from the English language faculty of Sepahan Institute of Higher Education. All of them have over 10 years' experience in their job as teachers.

3.2 Instrument
Semi-structured interview protocol was used in this study and consists of 2open-ended questions in total as follow:

How you define digital literacy, competence, identity and intelligence?

How much digital literacy, competence, identity and intelligence skills are important through your jobs and lives?

3.3 Data collection procedures
Semi-structured online interviews with all these teachers were held using open-ended questions addressed in the survey. The teachers were asked to provide more details about semi-structured online interviews. The interviews questions were based on Digital competence areas (Janssen et al. 2013). The interviews provided the researchers with the opportunity to further explore and have an in-depth inquiry of the results received through the survey.

3.4 Data analysis

In the context of conceptualizing the collected data, the thematic content analysis method was used. Thematic content analysis is used for qualitative data, and the researchers examine data for finding repeated idea and perceptions. In the present study, teachers' idea and their awareness level about 4D skills were determined.

4. Results

As shown in figure 3, the interviewed teachers have evaluated their knowledge in 4D skills. This shows that most teachers are not familiarized enough with the general definitions of 4D skills.
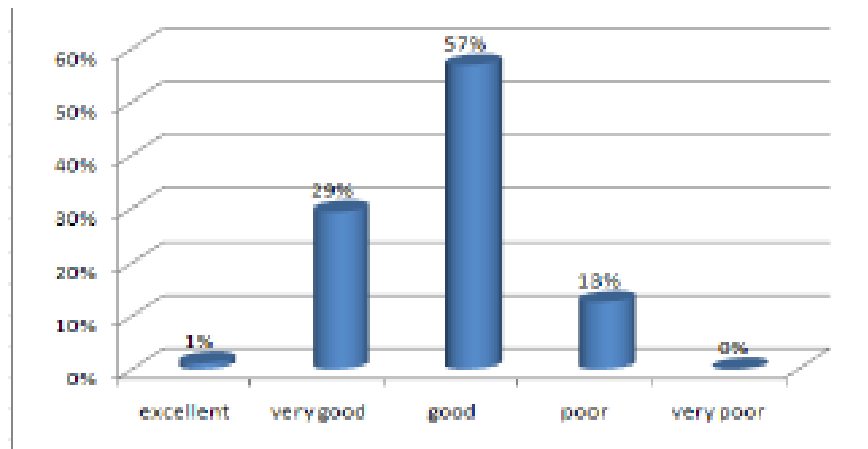
Figure 3. Percentage of responses regarding teachers 4Dskills evaluations

Regarding the question about the digitally literate and competence teachers, 87% of teachers only were familiar with their meaning, and they could not define each of them separately. It is clear from figure 4 that teachers (33%) try to develop their 4D skills through their jobs and lives, 27% of them pay attention to these 4D skills in their jobs, 18% just in their lives, 9% have low knowledge about 4D skills, 8% are just familiar with 2Dskills, and 5% do not have any familiarity with these 4D skills.
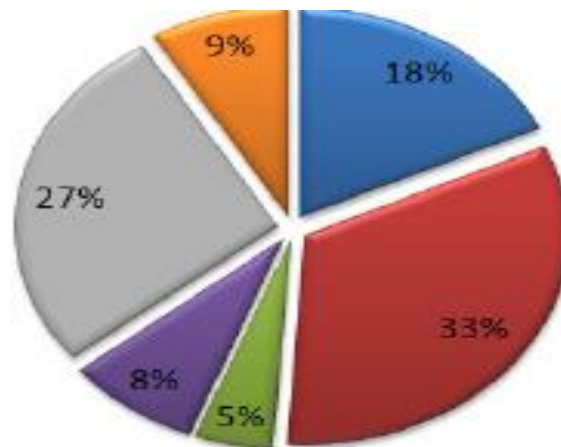
Figure 4. Percentage of teachers' responses regarding the construction of 4D skills through their jobs and lives.

In this study, the teachers have shown their highly developed awareness of the need to improving and developing their 4D skills, this is confirmed by 88% of teachers who feel it is necessary to take into consideration their 4Dskill development, 29% of teachers had a neutral idea, and 15% of them were not interested in 4D skills at all (see figure 5).
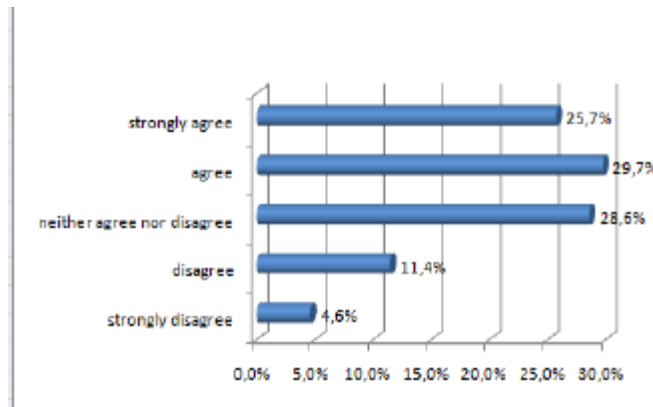
Figure 5. Percentage of teachers' responses regard constructing 4D skills

5. Discussion

This study aims to clarify the meanings and definitions of 4D skills for a better understanding of them and measuring teachers awareness about 4D skills through the 4D framework parts proposed by researchers. This framework is designed for developing and measuring of teachers 4D skills. According to Wenger (1998), identities are not static but are constantly changing in a way that ties the past to the future. Henderson & Bradey (2008) stated that in the tertiary teaching context, the literature reports that identity shapes lecturers' engagement with teaching technologies, pedagogical strategies, as well as the privileging of certain narratives.

Based on the retrieved data, the majority of teachers are not familiarized enough with the general definitions of 4D skills, and 87% of teachers only were familiar with their meaning, and they could not define each of them separately. It means that teachers should develop their 4D skills more than before to prepare themselves to teach in online environments.

In order to address this urgent need, the Quality 4D skills frameworks for measuring and developing teachers 4D skills were proposed. Quality 4D skills frameworks is a set of skills that needed to meet the demands and challenges of digital education and in extended form digital world, including digital literacy, digital competence, digital identity and digital intelligence.

In light of low teacher' understanding of 4D skills definitions, it is possible to argue that the self-evaluation of their 4D skills reflected the highly developed awareness of the need to improving and developing their 4D skills, this is confirmed by 88% of teachers who feel it is necessary to take into consideration their 4Dskill development. Whereas 29% of teachers had a neutral idea and 15% of them were not interested in 4D skills at all.

The awareness of teachers about 4D skills is vital for their teaching pedagogy. We would argue that more research is needed to construct literate and competent teachers in order to guide the teaching of such skills to students. Likewise, there is a need to establish a framework for students '4D skills development. This study also measures the teacher's awareness about 4D skills used in their personal and academic lives. An exploration of their awareness about 4D skills indicated that they had not knowledgeable enough in digital skills.

Based on Janssen et al. (2013) competence model and Basic skills of digital intelligence of DQ Institute (2017) the researchers proposed a Quality 4D skills framework that has nine basic components as digital literacy, digital competence, digital identity and digital intelligence (digital emotional intelligence, digital communication, digital right, digital safety, digital security, digital use). (See Figure.6). This framework can help teachers develop and improve 4D skills that essential skills for them in the 21st century. All components of this framework are handy skills for teachers who want to be competent and literate in their job and lives as digital citizen. By applying such a framework in for training teachers, we will have quality digital teachers in online environments.

Figure 6. Quality 4D skills framework (Froutanian and Dshtestani 2021)

6. Conclusion and Recommendations

Along with the speedy development of the digital world and technology, teachers should be knowledgeable about 4D skills and evaluating themself for being more effective. In the present study, the researchers identified teachers' awareness about 4D skills and their definitions. Their findings indicated that teachers were not aware of 4D skills, and they perceived themselves to be not competent enough in these skills for personal, educational, and professional purposes. Their concept of 4D skills seemed to made of different. While we focused solely on teachers' conceptualization of 4D skills understanding and their level of awareness, future research can employ observations of actual use or activities in which teachers can be presented with a problem using these 4D skills. This could provide a more comprehensive insight into teachers' digital 4Dskills levels. Another area for future research involves teachers use of 4D skills for professional development. Although some teachers acknowledged the use of 4D skills for professional development, they would definitely benefit from further guidance in using 4D skills in various ways to become more digital competent in their profession.

The present study sheds light on teacher's 4D skills level in Iran. However, when followed by further studies in other countries, it might contribute to the emergence of a comparative framework that allows for generalizations. It would be beneficial to look at this issue from a broader perspective to explore to what extent the definitions of 4D skills differ from each other; what commonalities or differences exist regarding 4D skills of teachers and whether it is ever possible to reach a common and shared understanding of the definition and components of 4D skills that would inform educational policymakers and instructors. By examining such questions, future studies might also contribute to establishing a framework for the measurement of 4D skills of students and their understanding.

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