From Solving a Health Problem to Achieving Quality of Life: Redefining eHealth Literacy

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Abstract

eHealth literacy is an emerging concept of scholarly interest that is seen as the extension of health literacy in the digital era. This study proposes a new definition of eHealth literacy to facilitate future research on this growing scholarly area. Based on the analysis of 14 definitions of eHealth, health and digital literacy, this study defines eHealth literacy as the interplay of individual and social factors in the use of digital technologies to search, acquire, comprehend, appraise, communicate and apply health information in all contexts of healthcare with the goal of maintaining or improving the quality of life throughout the lifespan. Researchers should now focus on developing operational measures to develop a valid and reliable means to measure eHealth literacy.

Keywords

eHealth, eHealth literacy, digital literacy, health literacy, concept explication

Introduction

Literacy is an attribute that every individual in a society is expected to have. At the most basic level, it is demonstrated by one's ability to read and write (Genlott & Grönlund, 2013; Sørensen et al., 2012). In addition people learn specific forms of literacies as a means to improve their quality of life (UNESCO, 2006). One important literacy is health literacy. According to World Health Organization (WHO), health literacy serves as a critical determinant of health and is the goal of health education (2013). In effect, having an adequate level of health literacy is critical to achieve positive health outcomes at the personal and community level (Nutbeam, 2008; Sørensen et al., 2012).

Along with health literacy, a growing body of empirical studies have also explored the concept of eHealth literacy (e.g., Brown & Dickson, 2010; Koo, Norman & Chang, 2012; Mitsutake, Shibata, Ishii, Okazaki, & Oka, 2011; Sheng & Simpson, 2013; Soellner, Huber, & Reder, 2014; van der Vaart et al., 2011). eHealth literacy is distinguishable from health literacy because it includes acquiring and using health information using digital technologies. It is an important area of research as people are increasingly accessing health information using digital technology, particularly the Internet. By 2012, one in two American adults accessed the internet to gather health information (Pew Internet, 2013).

To date, most studies in eHealth literacy use the definition proposed by Norman and Skinner (2006b). They define eHealth literacy as *"the ability to seek, find, understand, and appraise health information from electronic sources and apply the knowledge gained to addressing or solving a health problem."* Although this definition has been useful as a first step to conceptualize and operationalize eHealth literacy, it has been criticized by several scholars

since it did not fully account other factors that are crucial to describe eHealth literacy (Gilstad, 2014; van der Vaart et al., 2011). In order to advance such concept, an encompassing conceptual definition is needed in order to develop an accurate operational definition that can guide the development of valid measures for eHealth literacy (Kiousis, 2002). The lack of clear conceptual definition of eHealth literacy is also problematic as this hinder theory development. For instance, Mackert and colleagues (2014) suggests that more than 93% of published studies on eHealth and health literacy are not theory driven. It is only after understanding what eHealth literacy means that this area of research can create an impact to theory, and later, practice.

In order to understand eHealth literacy, it will be beneficial to examine it through concept explication. Proposed by Chaffee (1991), concept explication is a scholarly activity of critically theorizing a particular concept. Although it may seem to be part of an empirical study, the level of output produced from such activity is considered as a complete research project (Kiousis, 2002). Aside from theorizing, this method is also a practical means to elucidate a vague concept. Therefore, the goal of this study is to come up with a new conceptual definition of eHealth literacy that can guide future research. To come up with a new definition, existing definitions of eHealth literacy as well as other related concepts will be reviewed.

General Background on eHealth Literacy

The term eHealth literacy was first proposed by Norman and Skinner in their 2006 article *eHealth Literacy: Essential Skills for Consumer Health in a Networked World* (2006b). Their definition was developed by modifying the US Institute of Medicine's (IOM) definition of health literacy (2004). Norman and Skinner's definition was instrumental as it paved the way for scholarly interests on eHealth literacy as evidenced by empirical studies that used their definition (e.g. Brown & Dickson, 2010; Koo, Norman, & Chang, 2012; Mitsutake et al., 2011; Neter &

Brainin, 2012; Sheng & Simpson, 2013; Soellner, Huber, & Reder, 2014; van der Vaart et al.,

2011).

Acknowledging that eHealth literacy is a concoction of multiple literacies, Norman and

Skinner introduced the Lily Model (2006b) to represent the six literacy components involved in

eHealth literacy: traditional literacy, health literacy, information literacy, scientific literacy,

media literacy, and computer literacy. Within the model, eHealth literacy can be divided in to

two groups: analytic skills (traditional, media and information literacy) and context specific

skills (computer, scientific and health literacy).

After developing the concept of eHealth literacy, Norman and Skinner operationalized it

and proposed the eHealth Literacy Scale (eHEALS) (2006a). The eHEALS is an eight item self-

report tool that can be administered by researchers and health professionals to determine the

extent of a person's eHealth literacy. A high eHEALS composite score suggests high eHealth

literacy. Aside from empirical studies conducted in English (Brown & Dickson, 2010; Neter &

Brainin, 2012; Sheng & Simpson, 2013), eHEALS has been translated in multiple languages

such as Chinese (Koo, Norman, & Chang, 2012), Dutch (van der Vaart et al., 2011), German

(Soellner, Huber, & Reder, 2014) and Japanese (Mitsutake et al., 2011).

The abovementioned empirical studies using eHEALS show that the scale satisfies

several measures of internal consistency and is a convenient tool to assess eHealth literacy.

Although it may be a reliable tool, the validity of eHEALS has not been without any criticism.

For instance, van der Vaart et al. (2011) found that eHEALS is not a valid measure of eHealth

literacy since their study shows that perceived eHealth literacy (measured through eHEALS) did

not predict actual eHealth literacy. Next, Gilstad (2014) criticized the eHEALS, the Lily Model

and Norman and Skinner's definition since they were developed without taking into

consideration some social factors that might play significant roles in eHealth literacy. These social factors include a society's culture, norms, beliefs and values that are inherent to the individual that uses eHealth applications. Overall, these criticisms suggest that further research is needed to understand what eHealth literacy is. A well-developed definition of eHealth literacy may help guide future research. Therefore, a survey of the literature for related terms provides valuable insights into its multifaceted meaning.

Method

To come up with a new definition, it is imperative to review several definitions that are directly and indirectly related to eHealth literacy. Aside from the definitions of eHealth literacy, this study reviewed prominent definitions of health literacy. Next, definitions depicting technology-related literacy were also reviewed. According to Morris (2007), this specific literacy has been conceptualized through various terminologies such as e-literacy, digital literacy, ICT literacy and technological literacy. Although there is no formal consensus on what terminology to use, the term digital literacy has been highly cited among the scientific community (e.g. Bawden, 2008; Eshet, 2004; Gilster, 1997; Lenham, 1995; Papert, 1996; Pool, 1997). As such, this study focused on searching definitions of digital literacy. Including this term as part of the search process will shed light on the 'e' component of eHealth literacy.

In summary, conceptual definitions of eHealth literacy, health literacy and digital literacy were reviewed. To obtain definitions, articles were searched using PubMed and Scopus. Manual search through Google was also performed to complement the database search. Keywords such as "eHealth literacy," "health literacy" and "digital literacy" were used as search terms. To avoid complexities in the search process, only unique and explicit definitions were reviewed. Sources were then reviewed whether it is the original source of a definition. If not, the article's references

were reviewed to find the original study in which the definition was first used. It is important to note that the definitions presented in this paper are not, by all means, exhaustive and must be viewed as a selection of readings.

Results

eHealth Literacy Conceptual Definitions

The literature search yielded four definitions of eHealth literacy (see Table 1). The earliest definition was proposed by Norman and Skinner in 2006. Based on their definition, eHealth literacy can be seen as a process-oriented approach towards acquiring health information with the goal of solving a health problem. Norman and Skinner's view of eHealth literacy is similar to the definition proposed by Koss (2011) with the exemption that she viewed users as "consumers" of health information that are able to arrive at health decisions by themselves or with assistance. Going back to eHealth literacy as a mixture of literacies, Chan and Kaufman (2011) recognize that eHealth literacy involves "a set of skills and knowledge that are essential for productive interactions with technology-based health tools." Accordingly, the level of productive interactions (i.e. use of eHealth resources) is dependent upon the core skills that an individual possess. These include information retrieval skills as well as adequate comprehension of health concepts. In general, the definitions proposed by Norman and Skinner (2006), Chan and Kauffman (2011), and Koss (2011) are viewed from a micro level perspective as their focus is solely on the characteristic of the individual. Contrary to the first three definitions presented, Gilstad (2014) proposed a macro level view of eHealth literacy. Here we see an individual's relevant skills being integrated with his/her own cultural, social and situational context.

Table 1.

Chronological Order of eHealth, Health and Digital Literacy Definitions

Date	Source	Definition
eHealth literacy (*N* = 4)		
2006	Norman and Skinner	The ability to seek, find, understand, and appraise health information form electronic sources and apply the knowledge gained to addressing or solving a health problem.
2011	Chan and Kaufman	A set of skills and knowledge that are essential for productive interactions with technology-based health tools.
2011	Koss	The ability of consumers (directly or with assistance) to use computers and other communication technologies to find, read and understand health information to make personal decisions.
2014	Gilstad	The ability to identify and define a health problem, to communicate, seek, understand, appraise and apply eHealth information and welfare technologies in the cultural, social and situational frame and to use the knowledge critically in order to solve the health problem.
Health literacy (*N* = 7)		
1997	Kickbusch	Health literacy implies the achievement of a level of knowledge, person skills, and confidence to take action to improve personal and community health by changing personal lifestyles and living conditions.
1998	Nutbeam	Health literacy represents the cognitive and social skills which determine the motivation and ability of individuals to gain access to, understand and use information in ways which promote and maintain good health.
2000	Ratzan and Parker	The degree to which individuals have the capacity to obtain, process, and understand basic health information and services needed to make appropriate health decisions.
2005	Zarcadoolas, Pleasant and Greer	The wide range of skills, and competencies that people develop to seek out, comprehend, evaluate and use health information and concepts to make informed choices, reduce health risks and increase quality of life.
2006	Kwan Frankish and Rootman.	The degree to which people are able to access, understand, appraise, and communicate information to engage with the demands of different health contexts in order to promote and maintain good health across the life course
2010	US Congress	The degree to which an individual has the capacity to obtain, communicate, process, and understand health information and services in order to make appropriate health decisions.
2012	Sørensen et al.	Health literacy is linked to literacy and entails people's knowledge, motivation and competences to access, understand, appraise, and apply health information in order to make judgments and take decisions in everyday life concerning healthcare, disease prevention and health promotion to maintain or improve quality of life during the life course.
Digital literacy (*N* = 3)		
1997	Gilster	The ability to understand and use information in multiple formats from a wide range of sources when it is presented via computers.
2006	Martin	Digital Literacy is the awareness, attitude and ability of individuals to appropriately use digital tools and facilities to identify, access, manage, integrate, evaluate, analyse 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.
2007	Educational Testing Service	…using digital technology, communications tools, and/or networks to access, manage, integrate, evaluate, and create information in order to function in a knowledge society.

Judging from the reviewed eHealth literacy definitions, one may wonder if it should be viewed at the individual level or be integrated with external factors such as those arising from culture and society. Perhaps, reviewing definitions on health literacy can provide some answers to this question as well as provide guidance on what goal should eHealth literacy aspire. Nevertheless, these existing definitions provide a foundation for a more thorough conceptualization of eHealth literacy.

Health Literacy Conceptual Definitions

The definitions of health literacy obtained in the literature search provide a compelling view of what kind of actions are desired by being health literate. Table 1 lists seven prominent definitions of health literacy. Specifically, the definitions can be grouped in to two. First, health literacy is viewed as a means to arrive at appropriate health decisions. This view of health literacy reflects the definitions that were proposed by Ratzan and Parker (2000) as well as the US Patient and Affordable Care Act (popularly known as the Obamacare) (2010). Although the two definitions share the same end point, an interesting difference between them is that the latter frames its definition on the understanding of just 'basic' health information and having communication (i.e. being able to express/communicate health) as part of health literacy.

The second group of definitions views health literacy as a driver to attain favorable health outcomes. For instance, Kickbusch (1997) views health literacy as a means toward health and frames it not only at the personal level but as well as to community health in general. Next, Nutbeam (1998) as well as Kwan, Frankish and Rootman (2006) concludes their definition with the individual being able to promote and maintain good health through health literacy. Lastly, Zarcadoolas, Pleasant and Greer (2005) including Sørensen et al. (2012) views health literacy as a skill that leads to increased quality of life. Among these health outcomes, the concept of quality

of life has been the major endpoint of any health literacy campaigns (Nutbeam, 2008). As such,

Norman and Skinner's view of eHealth literacy of just only addressing or solving a health

problem may be short-sighted.

In summary, health literacy definitions remind us of what should be the goal of eHealth

literacy. For eHealth literacy to be a major driver of health, its definition should not only be

limited with making appropriate health decisions. Instead, it must be extended to indicate the

attainment of positive health outcomes and, ultimately, an increased quality of life.

Digital Literacy Conceptual Definitions

To fully grasp the notion of 'e' in eHealth literacy, it is important to review some definitions on

digital literacy. Table 1 shows three definitions of digital literacy that were retrieved from the

search. In general, the definitions seem to reflect an individual's capability to appropriately

utilize electronic and digital technologies to gather, manage and effectively use information.

Although appropriate usage is the central theme of these definitions, subtle differences

are worth mentioning. For instance, Gilster's (1997) definition reflects the need to understand

information from a variety of formats. This is important since the level of interactivity when

using ICT devices today is much higher as compared before. From static text and images,

information on the internet can now blend text, audio and image all at the same time. Next, the

notion of societal contribution is expressed in the definitions proposed by Martin (2006) and the

Educational Testing Service (ETS) (2007). Specifically, the Martin (2006) views digital literacy

as a means towards constructive social action. On the other hand, ETS (2007) looks at digital

literacy as a means to be able to function properly in a knowledge society. It is apparent that

these definitions are grounded on the ideology of economic prosperity through a knowledge-

based society that is enabled by technology (2008). Nevertheless, the concepts ingrained within

these definitions will be of great use to come up with a well-developed eHealth literacy

definition.

Redefining eHealth Literacy

The literature search yielded 14 definitions of eHealth literacy ($N = 4$), health literacy ($N = 7$) and digital literacy ($N = 3$). In order to fully grasp how each definition may contribute to the new eHealth literacy definition, keywords from the definitions were analyzed following Sørensen et al.'s (2012) systematic keyword clustering (see Table 2). As compared with the six clusters proposed by Sørensen et al. (i.e. competence, skills, abilities; actions; information and resources; objective; context; and time), this study yielded a seventh cluster designated as 'technology'. This cluster was added since the definitions of digital and eHealth Literacy are grounded with the use of technologies. Based on the synthesis of clustered key terms found in Table 2, a new definition of eHealth literacy is proposed:

> *eHealth literacy involves the interplay of individual and social factors in the use of*
>
> *digital technologies to search, acquire, comprehend, appraise, communicate and apply*
>
> *health information in all contexts of healthcare with the goal of maintaining or improving*
>
> *the quality of life throughout the lifespan.*

Compared with Norman and Skinner's definition (2006b), the new definition highlights the following changes:

- Acknowledges the interplay of individual as well as social factors;

- Uses the term digital technologies rather than electronic sources;

- Includes 'communication' as part of the actions required;

- Changes the perspective from solving a health problem towards the application of

    information in different healthcare contexts (e.g. health promotion purposes);

- Recognizes eHealth literacy as a driver to improve or maintain quality of life; and

- Uses the phrase "throughout the lifespan" to denote that it is a continuous endeavor.

Table 2. Key Word Clusters

Competence/ skills/abilities	Action	Information	Technology	Objective	Context	Time
Ability A set of skills and knowledge Attitude Awareness Cognitive skills Competence Confidence Knowledge Level of knowledge Linked to literacy Motivation Person skills Social skills The capacity Wide range of skills, and competencies	Productive interactions To access To analyze To apply To appraise To communicate To comprehend To create information To define a health problem To engage To evaluate To find To identify To integrate To manage To obtain To process To read To seek To synthesize To take action To understand To use	Health information eHealth information Health information and concepts Information Services	Electronic sources Computers Digital resources Digital technology Communications tools Multiple formats from a wide range of sources Networks Technology-based health tools Welfare technologies	Increase quality of life Maintain or improve quality of life Promote and maintain good health Reduce health risks Take decisions To addressing or solving a health problem To enable constructive social action To function To improve personal and community health To make appropriate health decisions To make informed choices To make judgments To make personal decisions To reflect upon this process	Cultural Different health contexts Disease prevention Everyday life Healthcare Health promotion Knowledge society Situational Social Specific life situations	Across the life course

Discussion

The newly proposed definition of eHealth literacy is comprehensive yet concisely elucidates

several key aspects that are critical to improve its research agenda. To fully understand the

definition, it will be appropriate to offer some insights on how each of the sub-concepts

embedded in it can guide future research. A framework based on the salient points of the

discussion section is presented in Figure 1.

Figure 1. Framework for eHealth Literacy Research
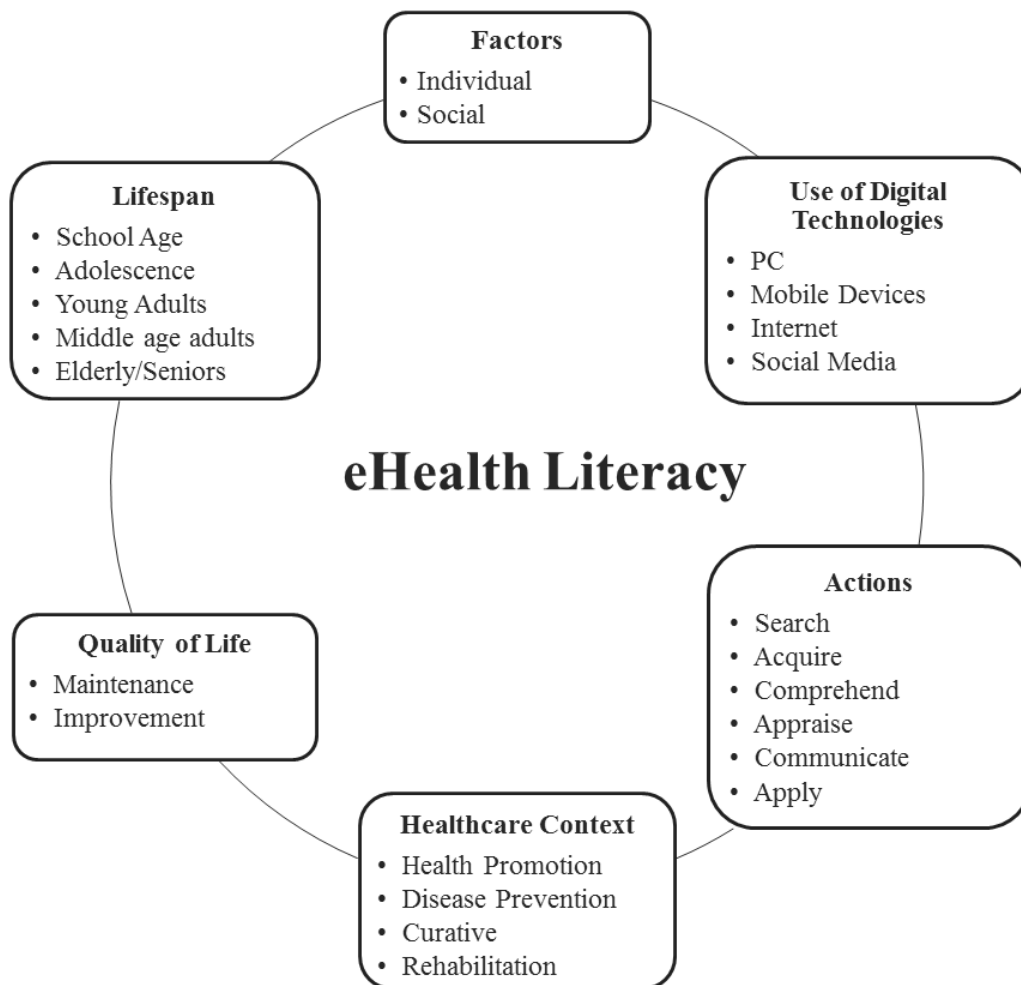
Personal and Social Factors

First and foremost, the definition recognizes the interplay between individual and social factors

in eHealth literacy. Departing from a microlevel approach, the new definition views at both

micro and macro level perspectives by looking at eHealth literacy as a "shared function of social and individual factors" (IOM, 2004). From this perspective, research on the antecedents of eHealth literacy should not only focus on individual factors but must also include social factors. Therefore, more studies are needed that synthesize both individual (e.g. cognitive factors) and social (e.g. health policies, socioeconomics) factors in the analysis. For instance, using the social-cognitive theory (Bandura, 1977) may shed light on both individual and social factors that affect eHealth literacy. Alternatively, personal and social factors can also be used as a basis of categorizing research respondents. For example, a research comparing eHealth literacy between Western and Asian societies will provide much needed knowledge on the role of culture in eHealth literacy.

Use of Digital Technologies

The definition also highlights the use of digital technologies as part of eHealth literacy. It is critical to acknowledge this term as this reflects the 'e' in eHealth literacy yet it does not only represent the term electronic. Instead, "digital technologies" is a term used to refer various technologies used such as (but not limited to) personal computers (PC), mobile devices (i.e. phones and tablets), the internet and social media (blogs, wikis and social networking sites). This means that an eHealth literate person has basic knowledge in using these technologies. In effect, when conducting eHealth literacy studies, it is critical to assess respondents' use of digital technologies as this will greatly influence their eHealth literacy. Future research can operationalize technology use in general, such as using the Technology Proficiency Self-assessment scale (Ropp, 1999), or focusing on a specific technology, for instance, using the Facebook Use Scale (Ellison, Steinfield, & Lampe, 2007) as a measure social media usage.

eHealth Literacy Actions

The definition specifies key actions when evaluating an individual's eHealth literacy. These include (1) searching, (2) acquiring, (3) comprehending, (4) appraising, (5) communicating and (6) applying health information. The words are arranged chronologically starting from searching to application of health information found using digital technologies. From this process, scholars can develop an operational definition of eHealth literacy. For instance, the degree of eHealth literacy can be measured by creating operational measures of the abovementioned process. A composite scale of each step of the process may provide a perceived eHealth literacy score (via self-report measures) or a true eHealth literacy score (via the experimenter's observation of participant actions). This suggests that higher scores translate to a higher degree of eHealth literacy. Therefore, future research may be conducted to create a psychometrically validated eHealth literacy scale developed from the proposed definition. This scale can then be compared with eHEALS (2006a) to determine which scale provides greater reliability and validity.

Healthcare Contexts

The definition informs scholars that eHealth literacy is relevant in all healthcare contexts. Specifically, eHealth literacy is evident in the context of health promotion, disease prevention, curative services and rehabilitation. Although the definition advocates the use of eHealth information in all healthcare contexts, it does not suggest that people use such information without medical advice. For instance, although a person found a better medication for a particular disease via the internet, he/she should not immediately use it without consulting a medical doctor.

Quality Of Life

Similar to health literacy, eHealth literacy should be thought of as a step towards the formation

of an acceptable quality of life (Nutbeam, 2000; Sørensen et al., 2012; WHO, 2013). Based on

the new definition, quality of life is not a one time achievement. It entails constant improvement

to the point of maintaining it when it has reached its highest peak. Consequently, there is a

critical need for more research to identify the link between eHealth literacy and its impact on

quality of life. Future studies should also strive to understand the mechanisms that underlie

between these links. It is only when we can fully understand the relationship between eHealth

literacy and quality of life that we can determine the former's true impact.

Lifespan

Research on eHealth literacy can be conducted throughout the lifespan. Understanding the

differences between each age group in terms of eHealth literacy will not only inform research but

will inform practitioners to tailor-fit the development of eHealth applications. For instance,

examining eHealth literacy among the elderly will greatly inform developers on how to further

improve the usability of their applications.

Conclusion

eHealth literacy has gained substantial interest among different scholars as it extends the

endeavors of health literacy in the digital age. As a growing field of research, it is necessary to

come up with an inclusive conceptual definition that can guide future research. This study

conducted a concept explication that reviewed a total of 14 eHealth, health, and digital literacy

definitions to come up with a well-informed conceptual definition of eHealth literacy. To restate,

eHealth literacy involves the interplay of individual and social factors in the use of digital

technologies to search, acquire, comprehend, appraise, communicate and apply health

information in all contexts of healthcare with the goal of maintaining or improving the quality of

life throughout the lifespan. With a new conceptual definition at hand, future research should

focus on developing an operational definition that will serve as a framework for a more reliable

and valid eHealth literacy scale.

References

Bandura, A. (1977). Self-efficacy: toward a unifying theory of behavioral change. *Psychological review, 84*, 191–215. doi: 10.1037/0033-295X.84.2.191

Bawden, D. (2008). Origins and concepts of digital literacy. In C. Lankshear & M. Knobel (Eds.), *Digital literacies: Concepts, policies & practices* (pp. 17–32). New York, NY: Peter Lang.

Brown, C. A., & Dickson, R. (2010). Healthcare students' e-literacy skills. *Journal of Allied Health, 39*, 179–184.

Chaffee, S. H. (1991). *Communication concepts 1: Explication*. Newbury Park, CA: Sage.

Chan, C. V., & Kaufman, D. R. (2011). A framework for characterizing eHealth literacy demands and barriers. *Journal of Medical Internet Research, 13*, e94. doi: 10.2196/jmir.1750

Educational Testing Service (ETS). (2007). *Digital Transformation: A Framework for ICT Literacy*. Retrieved from http://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdfhttp://www.ets.org/Media/Tests/Information_and_Communication_Technology_Literacy/ictreport.pdf

Ellison, N. B., Steinfield, C., & Lampe, C. (2007). The benefits of Facebook "friends:" Social capital and college students' use of online social network sites. *Journal of Computer–Mediated Communication, 12*, 1143–1168.

Eshet, Y. (2004). Digital literacy: A conceptual framework for survival skills in the digital era. *Journal of Educational Multimedia and Hypermedia, 13*, 93–106.

Genlott, A. A., & Grönlund, Å. (2013). Improving literacy skills through learning reading by

writing: The iWTR method presented and tested. *Computers & Education, 67*, 98–104.

doi: 10.1016/j.compedu.2013.03.007

Gilstad, H. (2014). *Toward a Comprehensive Model of eHealth Literacy*. Proceedings of the 2nd

European Workshop on Practical Aspects of Health Informatics. Retrieved from.

http://ceur-ws.org/Vol-1251/paper7.pdfhttp://ceur-ws.org/Vol-1251/paper7.pdf

Gilster P. (1997). *Digital literacy*. New York, NY: Wiley Computer Publishing.

Institute of Medicine (IOM) (2004). *Health literacy: A prescription to end confusion*.

Washington, DC: The National Academies Press.

Kickbusch, I. (1997) Think health: What makes the difference. *Health Promotion International,*

12, 265–272.

Kiousis, S. (2002). Interactivity: A concept explication. *New Media & Society, 4*, 355–383.

Koo, M., Norman, C. D., & Chang, H. M. (2012). Psychometric evaluation of a Chinese version

of the eHealth literacy scale (eHEALS) in school age children. *International Electronic*

Journal of Health Education, 15, 29–36.

Koss, S. (2011). *eHealth Literacy: HITECH & ACA consumer engagement*. Retrieved from

http://www.medicaidhitechconference.com/index.php/download_file/view/49/80/http://w

ww.medicaidhitechconference.com/index.php/download_file/view/49/80/

Kwan, B., Frankish, J., & Rootman, I. (2006) *The development and validation of measures of*

"health literacy" in different populations. Retrieved from

http://blogs.ubc.ca/frankish/files/2010/12/HLit-final-report-2006-11-

24.pdfhttp://blogs.ubc.ca/frankish/files/2010/12/HLit-final-report-2006-11-24.pdf

Lenham, R. (1995). Digital literacy. *Scientific American, 273*: 253–255.

Mackert, M., Champlin, S. E., Holton, A., Muñoz, I. I., & Damásio, M. J. (2014). eHealth and

   health literacy: A research methodology review. *Journal of Computer–Mediated

   Communication, 19*, 516-528.

Martin A. (2006). A European framework for digital literacy. *Nordic Journal of Digital Literacy,

   2*: 151–160.

Mitsutake, S., Shibata, A., Ishii, K., Okazaki, K., & Oka, K. (2011). Developing Japanese

   version of the eHealth literacy scale (eHEALS). *Japanese Journal of Public Health, 58*,

   361–371.

Morris, A. (2007). E-literacy and the grey digital divide: A review with recommendations.

   Journal of Information Literacy, 1, 13–28.

Neter, E., & Brainin, E. (2012). eHealth literacy: extending the digital divide to the realm of

   health information. *Journal of Medical Internet Research, 14*(1), e19.

Norman, C. D., & Skinner, H. A. (2006a). eHEALS: The eHealth literacy scale. *Journal of

   Medical Internet research, 8*, e27. doi: 10.2196/jmir.8.4.e27

Norman, C. D., & Skinner, H. A. (2006b). eHealth literacy: Essential skills for consumer health

   in a networked world. *Journal of Medical Internet research*, *8,* e9. doi:

   10.2196/jmir.8.2.e9

Nutbeam, D. (1998). Health promotion glossary. *Health Promotion International, 13*: 349–364.

   doi: 10.1093/heapro/13.4.349

Nutbeam, D. (2000). Health literacy as a public health goal: A challenge for contemporary health

   education and communication strategies into the 21st century. *Health Promotion

   International, 15*, 259–267.

Nutbeam, D. (2008). The evolving concept of health literacy. *Social Science & Medicine, 67*,

2072–2078.

Papert, S. *The Connected Family*. Atlanta, GA: Longstreet Press; 1996.

Pew Internet (2013). *Health online 2013*. Retrieved from

http://www.pewinternet.org/2013/01/15/health-online-

2013/http://www.pewinternet.org/2013/01/15/health-online-2013/

Pool, C. R. (1997). A new digital literacy a conversation with Paul Gilster. *Educational*

Leadership, 55, 6–11.

Ratzan, S. C., & Parker, R. M. (2000). Introduction. In C. R. Selden, M. Zorn, S. C. Ratzan, &

Parker, R. M. (Eds.), *National Library of Medicine Current Bibliographies in Medicine:*

Health Literacy (pp. v–vi). Bethesda, MD: National Institutes of Health, U.S. Department

of Health and Human Services.

Ropp, M. M. (1999). Exploring individual characteristics associated with learning to use

computers in preservice teacher preparation. *Journal of Research on Computing in*

Education, 31, 402–424.

Sheng, X., & Simpson, P. M. (2013). Seniors, health information, and the internet: Motivation,

ability, and internet knowledge. *Cyberpsychology, Behavior, and Social Networking, 16*,

740–746.

Soellner, R., Huber, S., & Reder, M. (2014). The concept of eHealth literacy and its

measurement: German translation of the eHEALS. *Journal of Media Psychology:*

Theories, Methods, and Applications, 26, 29–38.

Sørensen, K., Van den Broucke, S., Fullam, J., Doyle, G., Pelikan, J., Slonska, Z., & Brand, H.

(2012). Health literacy and public health: A systematic review and integration of

definitions and models. *BMC Public Health, 12*, 80.

United Nations Educational, Scientific and Cultural Organization (UNESCO). (2006). *Education

for all: Literacy for life.* Retrieved from

http://www.uis.unesco.org/Library/Documents/gmr06-

en.pdfhttp://www.uis.unesco.org/Library/Documents/gmr06-en.pdf

US Congress. (2010). *Patient and Affordable Care Act of 2010*. Retrieved from

http://www.hhs.gov/healthcare/rights/law/title/v-healthcare-

workforce.pdfhttp://www.hhs.gov/healthcare/rights/law/title/v-healthcare-workforce.pdf

Van der Vaart, R., van Deursen, A. J., Drossaert, C. H., Taal, E., van Dijk, J. A., & van de Laar,

M. A. (2011). Does the eHealth literacy scale (eHEALS) measure what it intends to

measure? Validation of a Dutch version of the eHEALS in two adult populations. *Journal

of Medical Internet Research, 13*, e86.

World Health Organization (WHO). (2013). *Health literacy: The solid facts*. Retrieved from

http://www.euro.who.int/__data/assets/pdf_file/0008/190655/e96854.pdf

Zarcadoolas, C., Pleasant, A., & Greer, D. S. (2005). Understanding health literacy: An

expanded model. *Health Promotion International, 20*, 195–203.