휴먼웨어 연구 제5권 제1호
Journal of Humanware
2022. 4. Vol.5. No.1. pp.19~46

The Virtual is Real: Digital Literacy and Learning in an Online Environment

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▣ ABSTRACT ▣

In light of the COVID-19 pandemic and the growing importance of non-face-to-face interactions in society, this study explored the meaning of digital literacy as the "refinement of 21st century skills." This work also identified directions for digital literacy education, which assumes many aspects in tasks and activities, from the perspective of interaction.

In pursuit of these lines of inquiry, the author of the present study participated in and observed a class on digital literacy conducted at a local government lifelong learning center in Korea, and examined and recorded the predominant features of observed teaching strategies, interactions, and learner responses. At the conclusion of the observed module, participants' responses were collected via a questionnaire and analyzed. The analytical findings of this study carry the following implications for digital literacy education. First, unlike in online education, in which the delivery of the educational content is prioritized, digital literacy education should emphasize the formation of knowledge and social interaction in the online space. In relation to the digital literacy learning process, participants' satisfaction was found to be related to a sense of presence, the quality of collaboration and cooperation, and the realization of interactions, such as the sharing of experiences in the acquisition of digital literacy. Furthermore, such experiences were creatively expressed in learner-learner, teacher-learner, learner-content, and learner-interface dyads. Finally, despite the case study being limited to an adult education course, both pedagogical as well as andragogic principles were observed. Through digital interactions, learners can boost participation and social will in non-face-to-face communities.

[Keywords] COVID-19, digital literacy, non-face-to-face education, interaction, teaching design, digital communication

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Ⅰ. Introduction

Online, real-time education using digital tools has expanded rapidly amid the ongoing COVID-19 pandemic, which has seen primary, secondary and post-secondary educational institutions utilize remote learning technologies on a massive scale. Distance learning has existed in some form for years, designed principally for learners unable to attend face-to-face lectures or classes, and often comprised playbacks of pre-recorded lectures. However, the COVID-19 pandemic tasked many educational institutions with accommodating all of their learners in a real-time virtual environment for the first time.

At the outbreak of the COVID-19 pandemic, private and public response efforts were focused on dealing with the serious risks the new disease posed to public health. However, as of 2022, many developed countries have conducted public vaccination campaigns (to varying degrees of success), and authorities have begun to treat COVID-19 as an endemic, rather than pandemic health threat. In living with COVID-19, it has become necessary to both better manage and develop non-face-to-face lifestyle activities, including educational activities, and so some degree of digital literacy is now required communication, work, leisure, and education. Amid the expansion of virtual social spaces experienced through computers or other electronic devices, digital literacy has become a basic skill necessary for living in the 21st century, much as classical literacy was in the 19th and 20th centuries. Traditional educational methods no longer satisfy the needs of the present. And so through virtual means, educational space has both shifted and expanded, from the confines of educational institutes out to local communities, organizations, homes, and personal spaces.

Enterprises running online platform businesses allow some limited use their platforms free of charge. Taking advantage of these platforms, learners can play a dual role as both consumers of educational technology and producers of vital data, contributing input and responses, and in doing so exerting influence on the trend toward improved digital literacy for the public at large. These platform businesses have also enhanced educators' online learning and teaching abilities by providing digital tools and cloud-based educational

environments (Williamson et al., 2020).

In the ever-changing environment of non-face-to-face, virtual interaction, this study identifies the following avenues for improvement in digital communication and the implications carried for digital literacy education. First, as contact-less lifestyles become more and more common, digital communication must be seen as more than a supplementary tool for overcoming limitations of time and space. Second, digital communication-based education should aim to make education widely and readily accessible through distinctive methods that recognize the key factors that decide the quality of an educational experience. Unlike traditional remote education, the kind of non-face-to-face education happening now is taking place online in real-time, and conducted entirely through digital interactions. However, unlike face-to-face education, these interactions are performed by participants using electronic devices, and to maximize educational value, these participants should be armed with a measure of digital literacy.

In Korea, the number of sites offering digital learning teaching digital tools or communication skills useful for enhancing online teaching-learning competency has grown. The Korean central government has for some time conducted information education campaigns targeting underprivileged classes, but digital learning environments have spread far beyond schools ever since the pandemic, following a pilot run of a major educational initiative, the 2020 Digital Learning Environment Project. By 2021, the project had expanded to domains outwide the traditional purview of education, with one thousand digital learning environments being run by administrative welfare centers, lifelong learning centers, and libraries, among others.[1] Digital learning environments have become a major educational topic at local lifelong learning centers, focusing on digital literacy acquisition.

Amid this swift expansion of virtual education, it is urgent to find effective directions for educational interaction, taking into account digital communication features at this nexus, which represents a conversion to and expansion of online real-time education. Based on an awareness of the problems and issues surrounding digital interaction, this study identifies

1) Digital learning environment (https://xn--2z1bw8k1pjz5ccumkb.kr/site/nia/main.do)

the features of educational interaction based on a case study of adult group learning in which participants reported high levels of satisfaction with real-time online learning.

Ⅱ. Theoretical Background

1. Digital Literacy

The term “digital literacy” was coined by technology journalist Paul Gilster in the 1990s, who defined it as the ability to use and comprehend information from various digital sources. By the 2000s, digital literacy had already become a kind of basic literacy. Bawden (2008) defined digital literacy as the modern version of traditional literacy, being the ability to read, write, and understand digital formats. These (and other) skills were referred to as “computer literacy”in the 1980s and “information literacy” in the 1990s, but the latter has a more comprehensive meaning whereas the former mostly refers to a set of formulaic skills. Information literacy generally refers to the ability to assess a diverse amount of information and judge the sources of said information. There is some overlap here with the terms library literacy and media literacy (Bawden, 2008).

Digital literacy has also been described as a kind of attitude. Bruce (1997) argues that this attitude is made manifest by independent self-directed learning, the use of information processes and the use of a variety of information technologies and systems. In addition, the digital literacy has internalized values that promote the utilization of information having sound knowledge of the world of information, a critical approach to information, and the adoption of a personal information style. From a similar point of view, Shapiro and Hughes (1996) defined digital literacy simultaneously as tool literacy, resource literacy, social structural literacy (understanding the production and social significance of information), research literacy, publishing literacy, emerging technologies literacy, and critical literacy (Bawden, 2008).

Attempts to understand digital literacy continued into the new millennium. Gilster (1997) couched digital literacy in the late 1990s in educational terms. But it is obvious that digital literacy is more than mere reading, writing, and speaking skills; individuals and societies have since gone on to create, work, share, socialize, research, play, collaborate, communicate, and learn an astonishing variety of skills through digital media and technology (Meyers, Erickson & Small, 2013). Meyers et al. (2013) argues that digital literacy has evolved, transformed, and expanded, and has become central to cultural, civic, and economic participation (Aabo, 2005). It has become a "skill for activity," since it requires skills for expression, creation, sharing, communication, and engagement. Put simply, it has been redefined as more than a mere set of skills, and rather as an ability to use leverage digital information, through positioning, inference, organization, management, presentation, and assessment of qualitative and quantitative data (Chase & Laufenberg, 2011). In that sense, digital literacy is not a skill or ability learned through formal education, but rather through effectively communicating in new digital worlds at home and at work.

Meyers et al. (2013) identified three different perspectives on digital literacy that emerged in the literature of the 2000s. The first: Eisenberg, Lowe & Spitzer (2004) summarized digital literacy as a set of discrete abilities or behaviors expressed by the users of digital information systems, often in the process of inquiry, with some measurable characteristics. The second perspective is an understanding of digital literacy as the cultivation of habits of mind. These models focus on problem-solving capacities, and are abstract enough to be applicable to a wide range of situations and contexts. Buckingham (2003) argues that this perspective emphasizes the interrelationship of four factors in understanding new media, namely: representations, language, production and audiences. The third perspective is an understanding of digital literacy as engagement in digital cultures and practices. In this manner, digital literacy is defined by set of practices involving digital tools and media that are deeply embedded in a particular context or activity. These practices are emergent, being socially constructed and situated (Meyers et al., 2013).

Cultural and economic developments since the turn of the millennium have only fortified

the concept of the digital society and its subcontexts; human behavior is increasingly mediated by digital tools, and digital devices have become ubiquitous gates to virtual activities both at home and at work. The concept of digital literacy has also evolved beyond the notion of a kind of basic literacy useful in (but not essential to) personal endeavors (Martin & Grudziecki, 2006). Bélisle (2006) proposed not only a functional model of digital literacy, but also a sociocultural practice model and a model granting intellectual rights. The third model can be interpreted to suggest that literacy brings about a transformation and transition in the ability to think when new processing tools, such as new cognitive tools depending on digital technology, are developed (Bélisle, 2006; Martin & Grudziecki, 2006). Bélisle (2006) also emphasized that the evolving digital technologies are not only transforming access, but also fostering new approaches to knowledge, new knowledge architectures, new knowledge ethics, and new accountability requirements and assessments. The work goes on to argue that knowledge expertise today is a matter of understanding and mastering basic software-processing techniques and knowledge processing tools.

Digital literacy thus can be seen to have two functional characteristics: being useful for learning and various activities on the one hand, and on the other hand, having transformative properties that shape the thoughts and actions of learners. Applying this approach to digital literacy to educational issues reveals a major challenge to digital literacy education: distance education learning has long been aimed at delivering educational content to learners to be consumed. But this approach sees digital technology only as a means of content delivery, and overlooks the potential educational knock-on, or supplemental benefits of a digital learning environment. In order to overcome this problem, digital literacy education must employ a dual purpose: to effectively deliver content, as done in the past, and to amplify the educational effect obtained through an understanding of digital technology.

Digital literacy can be seen as a powerful tool for individuals and organizations to interpret themselves in a variety of ways vis a vis their relationship with digital sources (Martin & Grudziecki, 2006).

2. Interaction in an Online Educational Environment

Education usually fosters learning experiences and promotes the development of learners through interactions among three constituents: the teacher, the learner, and the text. The importance of establishing a framework for utilizing digital literacy in the transition to online education is deeply related to the ways in which interaction among educational constituents generates learning experiences.

Previous studies exploring methods and effects of remote education based on digital literacy focused on the features and problems posed by the digital environment to student adjustment and other issues (Kidd, 2020). Studies that examined the effects of remote education prior to the pandemic (see Somekh, 2007; Kali, McKenney, & Sagy, 2015) explored the ways in which how technology fosters "professional learning" (Murray & Kidd, 2016), and sought to adjudicate the appropriate use of online tools for teaching and learning. One study focused on teaching design (Laurillard, 2012), investigating how learning tasks, objectives, and the learning environment correspond to online education. Pre-pandemic, scholars documented how the early spread of remote learning required educators to develop new practices based on technology, individually or in collaboration with one another, and adopt a vastly different pedagogy (Somekh, 2007).

There also exists a robust literature on interaction in online educational environments based on digital communication. The extant scholarship explores the nature and effects of virtual interactions as described below.

First, depending on the target of interaction, research identified a new educational dyad in addition to the existing teacher-learner, learner-learner, and learner-content pairs: the learner-interface dyad (Moore, 1989). Moreover, studies found that interactions between learners through an interface, despite spatial separation, invigorates communication and helps learners form psychological and social connections that allow them to overcome educational challenges. Furthermore, these interactions come to serve as psychological and social bonds, and channels through which learners can collaborate and socialize (Bernard et al., 2004).

Second, scholars have also addressed the purposes motivating online interaction. In the information age, innovation is a function of two main factors: learning and collaboration. And so knowledge-building and social interaction have come to be seen as the underlying reasons behind virtual interactions in online learning environments. The Computer Supported Collaborative Learning (CSCL) system is a tool for knowledge sharing, building, and discovering the meaning of interactions. It is based on the knowledge-building community (KBC) theoretical model (Stahl, 2003), and has been utilized by scholars to study online interactions. The KBC model is a social-constructivist oriented pedagogical model developed by Scardamalia & Bereiter (1996). It builds on social-cultural theories of learning that view learning as process of participating and interacting in a community of practice (Sing & Khine, 2006). KBC encourages the adoption of a sociocultural perspective that views education as something other than mere knowledge acquisition and production, and as the shared experience of a creative and critical process. Henri (1992), grounded in KBC theory, used the CSCL to highlight five dimensions of interaction in the learning process.

〈Table 1〉 Henri's model of content analysis

Dimension	Categories
Participation	Levels of participation; types of participation
Social	Statement or part of statement not related to subject matter
Interactivity	Explicit interaction: direct response, direct commentary Implicit interaction: indirect response, indirect commentary, independent statement
Cognitive skills	Elementary clarification; In-depth clarification; Inference; Judgement; Application of strategies
Metacognitive knowledge and skills	Personal; Task; Strategies; Evaluation; Planning; Regulation; Self- awareness

* Source: Sing & Khine (2006)

Third, the literature on adult learning theory also emphasizes the importance of interaction. Adult learning is typically seen as the pursuit of self-directed learning. Knowles (1990) advocated fostering learner competencies by encouraging a positive psychological climate brought about by trusting human relationships, arguing that learning is a

fundamentally human experience, and that people are more likely to learn if they are treated with respect and their needs attended to. Muirhead (2001) argued that academic collaboration, a form of adult learning, should be pleasant and support authentic sharing between learners. Burge (1994) found that online learners have additional special requirements, including a need to participate and respond, receive effective feedback, and experience focused messaging.

As the literature described above has found, people learn through enjoyable interactions in groups even in an online learning environment. However, no extant research on online education has argued that traditional andragogic principles — which stipulate that adult learning is self-directed, leverages adults' own experiences, and focuses on education through problem-solving cooperative processes — are applicable in a virtual environment. This perhaps owes to the fact that for online education to be productive, it is necessary for participants to have a solid grasp of the functions of the digital tools used. This raises implications for pedagogy, and makes clear the need for new approaches to curriculum design in online learning applications (Noor, Harun, & Aris, 2012).

Fourth, research has found that online interaction reinforces the notion of educator presence. Flottemesch (2000) found that in a remote learning setting, students tended to base their judgements of educational satisfaction on perceptions of the teacher interactions. This implies that it is important for teachers to have opportunities to develop their ability to create a confident online professional presence (Anderson et al., 2001; Murphy, Smith, & Stacey, 2002). Presence may be a major component of online learning, important for promoting and structuring an effective learning experience.

A wealth of new research on lifelong learning has emerged in the wake of the COVID-19 pandemic. Some studies found that the existence of social bonds, a sense of self-directedness, and the quality of interactions had an influence on learning satisfaction in an online learning environment at a university-affiliated lifelong center. Other literature has found that negative experiences with any of the above factors diminished learning accomplishments and made adjustment more difficult. For example, Lee (2020) established

that social bonds between teachers and learners were key factors in predicting academic performance and educational satisfaction, among other outcomes. Put simply, learners lacking established relationships with teachers and/or other learners can feel uncomfortable in online classes. In order to overcome the fundamental problem of spatial disjunction in a remote setting, teachers need to play a leading role and make the appropriate preparations (Kim & Jeong, 2020).

Opportunities to acquire and master digital literacy in an online environment are increasingly numerous, and so a framework for online teaching design for online digital literacy learning has become necessary.

It is for this purpose that this study identifies the main features of teaching in a qualitative case study of a virtual educational environments in which participants reported high levels of satisfaction. This paper finds that an effective online environment promotes both content acquisition and social interaction through special teaching methods grounded in knowledge of digital literacy.

Research Questions

The literature on digital literacy documents how digital literacy manifests itself in changes to people's attitudes and behaviors, as well as in terms of function. In this paper I verify these claims. In addition to this, I reveal ways in which digital literacy is used. Digital literacy tools have led to interactions that have influenced attitudes and manners of thought with regards to online education, both in teaching and learning.

The main research question and line of inquiry this paper pursues can thus be restated as follows :

What are the characteristics of digital literacy teaching that have enhanced interactions in online education?

Ⅲ. Research Method

1. Background

This study is a qualitative case study conducted through participatory observation of an online adult education program on digital literacy, in which learners participated in real-time using a diverse array of digital communication tools. The qualitative case study is an effective research method when the main research question seeks to explain an actual phenomenon, or when a certain phenomenon must be described in detail. That is, when the study is an empirical investigation of phenomena taking place in real life (Yin, 2009). In addition, qualitative case studies can produce new knowledge by collecting evidence from diverse data sources and converging them. To do so, it is desirable to develop a theoretical proposition to serve as the foundation of data collection and analysis (Yin, 2009). Merriam (1998) defined a qualitative case study as an intensive and general description and analysis of one particular factor, phenomenon, or entity, being particularistic (focused on one certain situation, event, program, or phenomenon), descriptive (providing a detailed description of the researched phenomenon), and heuristic (enhancing understanding of phenomena through research).

For this paper I studied online digital literacy training for professional lecturers, organized by prefecture-level government and educational authorities in a district of Seoul, South Korea. The district and its authorities will be referred to from here on as "D-government" or simply "D." Considering the definitions proposed for the term digital literacy in its vast literature, for this paper I define the term as the ability to understand and use digital online tools and programs.

The district under observation has a local population of 375,000 with one lifelong learning center, and 14 administrative subdivisions. In addition, this district has 12 dispersed local learning sites that cater to specific neighborhood communities.

As other prefectures have done since the outbreak of the pandemic, D authorities have

moved formerly offline lectures and educational programs to online platforms, but found that many classes were not optimized for an online environment. D responded by offering classes on digital communication and the use of digital tools in 2021. I observed and participated in one of these classes for this qualitative case study. I attended a digital tool-based lecture on organizing and using digital tools in diverse ways and a digital literacy lecturer training class on using digital tools for learning and practice. The content of the classes included lectures on digital productivity and communication platforms such as Slido, Jamboard, Padlet, PowerPoint, and Zoom. Classes also dealt with cloud storage services such as Google Drive, experiences in metaverse-adjacent spaces (Gather town), image making, and practice tests.

The research period of the qualitative case study coincides exactly with the period of the adult education program under investigation, which held classes three hours a day, three times a week from August 16 to September 14, 2021. I participated in the class as a learner, observed all lectures, and kept a record of them. The lectures, which were focused on digital literacy acquisition and digital literacy teaching, took place on the Zoom video conferencing platform. To facilitate interaction between the teacher and learners, the Zoom chat function was used simultaneously with group chat software developed by Korean firm Kakao.

In addition to delivering core educational content, the class was designed to equip learners with the ability to productively wield a diverse array of digital tools, and be able to pass a professional lecturer certification test after one month following the conclusion of the educational module. I observed all of these processes. In the service of this paper's hypothesis, I surveyed learners, inquiring as to their opinions on the teacher's teaching and overall satisfaction regarding class participation using an open questionnaire. Prior to conducting the survey, I sought and received permission from the teacher and the learners (the study participants) regarding teaching and learning records and progress and the results of surveys for my research.

The class participants have since gone on to create a series of online demonstration

lectures on digital literacy following the conclusion of the course six months ago from the date of this writing. I observed characteristics of interactions in participants' teaching styles similar to those learned in the class. In other words, I found direct anecdotal evidence that teaching and interaction in the online class had an immediate and meaningful impact on the learners' teaching styles.

2. Data Collection and Analysis Method

Data collection consisted of surveys of learners' qualitative self-assessments of their educational satisfaction. Learners were asked to fill out an open questionnaire comprising one optional question ("What were you satisfied with this class?") and one open-ended question ("What was enjoyable about this class?") A total of 11 female adult learners in their 40s and 50s participated in the surveys.

〈Table 2〉 The study participants

Age range	Academic background	Occupational status
Nine participants aged 50-59, two participants aged 40-49 at the time of the study	Nine participants had earned bachelor's degrees at the time of the study	Seven participants employed at the time of the study

Second, the main features of interactions with educational effects were observed and recorded. I kept detailed records of these interactions, which the teacher specially arranged and performed. In addition, I collected and analyzed records of learner comments and reactions to these interactions left in the Zoom chat window or Kakao group chat. I also noted and recorded the features of interactions between the teacher and students during the course of the various class activities and tasks. Interaction data were classified into teacher-learner, learner-learner, learner-content, and learner-interface interactions, and were further examined by categorizing it in terms of acquisition of digital literacy and social interaction. The records were organized by time series and curricula, and were described

based on how long it took for learners to go from complete ignorance regarding a digital software suite or tool to demonstrating mastery and digital literacy.

Third, digital literacy was part of the educational content of the course. But I observed how digital literacy was used for promoting learning and facilitating interaction. Given what the extant literature says about the nature of adult education, and particularly the importance of self-directedness, practical use, and the utilization of experience in adult education as argued in Knowles (1990), I was particularly interested in how digital literacy contributed to realizing educational outcomes in this setting.

Ⅳ. Results

1. Learning Satisfaction Factor

As shown in Table 2, the learners surveyed for this study are mostly employed individuals in their 40s and older, with at least a bachelor's degree or higher. The group demonstrated an ability to actively facilitate an environment conducive to learning, leaving messages of gratitude to the lecturer and actively responding to questions. That is, they were self-directed learners who could obtain certain degree of satisfaction through their own efforts.

The 11 study participants were surveyed on the major determinants of class satisfaction (see Chapter III Part 2) and the majority of respondents indicated that the lecturer had the greatest impact.

〈Table 3〉 Survey results

Question	What's the main factor that influenced class satisfaction? Please describe how.				
Factors	Lecturer	Education program	Other participant	Online environment	Other
Number of respondents	8	2	0	0	1

In addition, learners offered explanations for why and how the lecturer exerted a strong influence on their satisfaction with the class. The survey respondents cited the lecturer's passion, ability to induce participation, ability to preside over class, provision of personal experiences and know-how, and described a feeling of being assimilated into the lecturer's will to teach. Survey respondents also expressed gratitude to the lecturer for one-to-one guidance, thoughtful consideration, and a considered approach to the introduction of new knowledge. These descriptive data point to the formation of a strong interactive bond between the lecturer and learners in the observed educational environment.

2. Features of Interaction

I classified observations of interactions into four types, based on the framework established in the literature (see Chapter II, Part 2): teacher-learner, learner-learner, learner-content, and learner-interface. My observations are as follows.

Classes generally progressed in three stages. In the first stage, the teacher conducts a brief review of material previously covered and elicits responses from the learners. Importantly, it is during this stage in which the teacher outlines the day's educational content and works to create an environment in which learners can interact with an interface by introducing a specific digital tool or platform. The teacher describes the digital communication tool or program that is the subject of the day's lesson and elicits responses from the learners to verify that they have understood the educational content delivered. These observations show that in the first stage, learner-content and learner-interface interactions take place passively following teacher instruction. Interaction is teacher-centered, learners' voluntary participation is low, and the relationship between content and interface is adaptive in nature; thus, number of interactions is relatively small.

However, in the second stage, the teacher begins to deliver the core educational material of the lesson, and to facilitate this, gives learners the opportunity to perform practical exercises. In being provided a hands-on opportunity to use digital tools, learners are afforded the chance to directly experience how they can influence, shape, and invigorate

communication. These hands-on experiences with digital tools often provoked positive emotional responses from the learners. Furthermore, as learners' motivation to use the digital tools increased, cognitive interaction with content increased as well. When a learner faced difficulties in performing these practical exercises, the teacher responded individually; learners facing similar challenges benefitted from these explanations.

By this point, the core educational content of the lesson has been delivered and the learners have had ample opportunity to practically experience the digital tools being taught; learner-content and learner-interface interactions occur frequently in this stage. The teacher answers learners' technical questions directly or asks other learners to answer them based on their experiences; in this way learners receive educational support from other learners as well as the teacher, and the educational environment is enhanced by a sense of collaboration as each learner practices a digital tool or skill. The teacher provides positive feedback and encouragement as learners feel their way around the digital tools. In the third and final stage of the lesson, learners upload the results of their practical exercises to the group chat. Interactions are mostly positive, with learners exchanging compliments and offering feedback.

〈Table 4〉 Observed interactions by stage

Process/type of interaction	Teacher-learner	Learner-learner	Learner-content	Learner-interface
First stage	Delivery-response(cognitive)	None(passive)	None(passive)	None(passive)
Second stage	Delivery-response(cognitive) Support-response(sentimental)	High(cognitive)	High	High
Third stage	Assessment-appreciation, confidence (sentimental)	Mutual assessment (sentimental)	Low(active)	Low(active)

I observed active interactions among learners two weeks into the module, and in particular during the third and final stages of the classes, which regularly featured a number of positive interactions among learners. It was during these interactions that the implications of andragogy theory became most evident. Learners had begun to trust the teacher's

diligence and expertise and demonstrated strong self-direction. Self-direction is a primary characteristic of andragogy, and I noted that learners in this class did not criticize one another but rather actively provided positive feedback. I observed other interactions typical of mature learners and documented in the theoretical and empirical literature, such as learners answering one another's questions in the chat. High rates of participation and concentration levels by learners are features typical of field-oriented adult learner tendencies.

3. Analysis of Social Interaction using the KBC Framework in CSCL

In today's knowledge-based society, it is important for educators to teach joint participation and collaboration methods, since two sides of innovation are lifelong learning and collaboration (Stahl, 2000). In the case of collective learning, learner interaction provides the experience of discovering and building knowledge together. And so knowledge-discovery and knowledge-building need to be analyzed alongside the learner interaction factor. The CSCL system based on the KBC framework (both of which were described in Chapter II Part 2), enables an analysis of knowledge-sharing and knowledge-building and how they are related to the kinds of social interaction that produce collective learning outcomes in an online environment. Furthermore, as the literature has suggested, adult learning often has an instrumental function, but nonetheless many adult learners enjoy the social aspect of learning activities. Thus, two factors - knowledge-building and interaction - should become the primary objects of analysis when studying the effectiveness of web-based adult learning. Here I analyze those two factors in online learning. First, I analyze participants' reasoning for their expressed satisfaction with the online learning experience. Second, I analyze the features of knowledge-building and social interaction recorded during my direct observations.

First, learners were found to be highly satisfied with the knowledge acquired during the course of the module, and many identified it as a major reason they enjoyed the course. Learners also described great satisfaction with the interactions they had with other people, and identified it has another major reason explaining their enjoyment of the module.

Open-ended descriptions authored by the learners, as shown in Table 5, suggest that their enjoyment was based on both the knowledge-building and interactive aspects of the course. The lecturer was also found to be associated with these aspects. The lecturer's professional demeanor, skill in selecting class content, and energetic attitude guided and facilitated learners' interactions with the core educational content and influenced knowledge acquisition. Learners frequently mentioned interactions in their explanations of class satisfaction, even though some did not explicitly use the term interaction but nevertheless described clear interactive influences in cognitive and sentimental terms, describing how getting to know new people and seeing other learners'accomplishments inspired active participation and helped to create an atmosphere conducive to learning.

〈Table 5〉 How knowledge and interactions influenced satisfaction

Category	Knowledge-based satisfaction factors	Interaction-based satisfaction factors
Statement	Participants expressed satisfaction with…	Participants expressed satisfaction with…
	–The educational content of the lectures	–The lecturer's thoughtful consideration
	–The energy with which the lectures were delivered	–The motivation generated upon bearing witness to other learners'work ethic and diligence
	–The feeling of enjoyment in acquiring new knowledge	–The high level of participation in class and the lively learning environment
	–The experience of being introduced to a new field	–The experience of getting to know new people
	–The acquisition of new program skills	–The comfort and ease with which they were able to participate in class

3-1. Features of Teaching

Here I analyze the features of the teacher's teaching, paying particular attention to interactions. Table 6 describes the main characteristics of those interactions. I examine three aspects of educational experiences: knowledge, skills, and attitudes.

Regarding the knowledge aspect, when delivering educational content I observed teacher-centered interactions in which the lecturer repeatedly sought to verify whether

learners had grasped the material by instructing them to transmit simple icons or numbers in the chat. In order to relieve learning fatigue resulting from these recurrent interactions, the lecturer provided compensatory digital information. In addition, in knowledge delivery interactions, the lecturer clearly delivered the core educational content in a cogent and systematic way, adjusting for some of the inconveniences and limitations posed by online space. These early, knowledge-centered interactions were mostly response-based, as knowledge acquisition was the core component of the first stage of the observed classes. In the second stage of class, however, learners had come to some level of understanding of digital literacy, and so the lecturer induced learner participation in the information delivery process using diverse methods. By the third and final stage of class, interactions became increasingly complex, encompassing responses, arguments, combination, and creation. These interactions are compound and variegated in the final presentation, since learners must display four competencies: knowledge delivery, inducing participation, common experience design, and new knowledge building, after choosing a digital literacy program and digital tool.

Regarding the skill aspect, the lecturer required response signals from learners to demonstrate understanding, and guided them in remembering how to operate digital tools or programs. In addition, in order to guide learners toward a better understanding and enjoyment of the digital tools and programs being taught, the teacher employed a diverse set of strategies to promote interaction with both the content of the module and the interface with which learners interacted. Specifically, the teacher increased contact with the digital practice environment, used digital tools and environments to entertain the learners, and enhanced cognitive and sentimental interactions among learners by sharing digital performances. As a result, learners frequently experienced the benefits of digital literacy in social exchanges and the formation of collective intelligence.

Regarding the attitude aspect, the lecturer here too employed a diverse strategic suite, expediting and encouraging interactions. The learners and the teacher were in concert creating the rules and mores for sentimentally stable interactions, and individual learners shared their problems with each other, enhancing the sense of shared camaraderie. See Table 6.

〈Table 6〉 Interaction strategies in teaching

Main features of observed teaching (three aspects)	
K	**1. Trust was established between the lecturer and the learners in the predictability of content to be taught and new knowledge to be introduced.** The content of the next class session was introduced the day prior
	2. There was a clear delivery system and direction. The lecturer provided clear direction to learners with regards to what information should be committed to memory and what information could realistically be ignored to minimize potential confusion and prevent learners from becoming overwhelmed by new information. The lecturer also made active efforts to make learners feel rewarded for participating in the course
	3. The lecturer fostered a better understanding of learning connections and principles by repeating material. The lecturer reviewed information and knowledge learned in the previous session several times
S	**1. A practical exercise program was prepared.** All learning processes were conducted based on practical exercises. The lecturer organized a comprehensive exercise regimen, with a diverse array of topics to appeal to the sensibilities of as many learners as possible
	2. The lecturer was passionate in demonstrating tools and programs, and incorporated an element of play. The teacher demonstrated the use of the programs and tools being studied in a gradual and deliberate way to ensure maximum understanding. Learners were given the opportunity to indirectly experience both the enjoyment and usefulness of the digital tools being studied based on practical exercises, which motivated them to use the tools first-hand
	3. Progress and performance on assignments were checked mutually. The lecturer assigned practical exercises and assessed performance those exercises in every stage of class, inspiring confidence and active participation. Performance was shared in the group chat, which featured teacher-learner feedback as well as learner-learner feedback. These behaviors enhanced the collective will to learn.
A	**1. The lecturer taught with a consistently polite attitude.** The lecturer spoke in a deferential manner and treated learners most courteously. One-on-one instruction was provided during free periods when any one individual exhibited a significant gap in theoretical or practical understanding with the other learners
	2. The problem-solving process was a shared experience. When asked a question, the lecturer interacted with the learner and involved other learners in responding to the question and addressing the root issue being raised. This reduced the burden on learners facing difficulties and allowed learners with a better mastery of the material to realize a more a self-directed learning experience by helping others solve problems
	3. Rules for interaction were established. The lecturer designed a series of signals and rules to facilitate learner responses not only to simple or routine questions, but also difficult assignments and educational content, stabilizing the rhythm of collective participation. For example, when learners were asked if they understood what the teacher had just said, they were instructed to write simply "1" in the group chat.
▼	
Evaluation criteria for learners' presentations	

knowledge delivery	inducing participation	common experience design	new knowledge building
pedagogical approach		andragogical approach	

Ⅴ. Discussion

This paper has explored the concept of interaction as core component of a teaching strategy on the online environment and has examined its educational significance. I investigated the significance of interaction through a qualitative case study: I directly observed a virtual class on digital literacy and insights produced from these observations carry implications for online adult education programs elsewhere, as the results of the study are consistent with the major principles of established andragogy but also support some degree of flexibility in its application. Here I summarize the main results of this study as they pertain to the teaching methods employed in adult education.

First, this study found that classes characterized by learner-learner, learner-content, and learner-interface interactions can generate good educational outcomes even in a virtual educational environment.

Second, interactions in remote education are useful in knowledge-building and social interaction. Interactions observed for this study were found to evolve from simple to more complex forms as individual classes (and even the module as a whole) progressed. In the first stage of class, a sense of interpersonal distance was observed, and interactions were characterized by simple responses. But over time, more diverse interactions were noted and a sense of intimacy was generated; this new learning environment triggered increased knowledge-building and social interactions, and reinforced learners' motivation.

Third, teaching interactions should be based on an appropriate strategic amalgamation of pedagogy and andragogy. Elements of pedagogy are useful even in adult education settings and particularly during information delivery, but strategies built from an andragogic framework become necessary as an educational module progresses. In other words, as adult learners accumulate knowledge, teachers should facilitate learner-learner interactions based on problem solving in which learners can leverage their own experiences. This could be done by assigning independent tasks to pairs or groups of learners, generating common experiences. Even in a remote learning environment, these interactions were found to

produce enjoyable social experiences among learners, as well as induce improvements to productivity and engender a feeling of participation. By the third and final stage of the classes observed, learners were collectively creating a collaborative learning process using highly advanced digital tools, expressing confidence and satisfaction and providing positive feedback to one another.

One post-study observation: online spaces were found to create various senses of reality through digital communication. For example, learners in the course participated through online meeting platform Zoom, utilized the digital whiteboard Jamboard and collaborative content-building app Padlet to sketch and share ideas in real time. The results of these collaborations were shared through the Kakao open chat. The simultaneous use of these multidimensional programs has only been made possible through the expansion of online spaces, and these spaces are host to unique interactions and responses.

Fourth, the results of this qualitative case study make clear that acquiring digital literacy requires social will beyond just interactions. As described above, in the process of acquiring skills for digital tools, the feedback of the teacher and the interactions between learners enhance the sense of being together despite real spatial distance, and this sense is essential to arousing dynamism in the group process. Humans have long promoted personal growth by creating experiences rooted in actual physical presence and activity, as well as reflective exercises for those experiences. However, in a digital society, the memories of experiences created through the body are replaced with symbols, transformed by digital tools. On the one hand, this leads to a reduction in physical activity, but on the other hand, the process of replacing human physical activity with other signs abstracts reactions to external social stimuli. For example, in a physical class, a learner or pupil may nod to signal understanding. But in a digital environment, that same learner might send a smile icon to the group chat; other signs and symbols may be mutually agreed to have a positive or negative connotation. In the process of transforming erstwhile physical behaviors into signs, reactions demonstrate a will to express thoughts following a process of abstraction; it can thus be said that the cognitive process of expressing social will is lengthened in a virtual environment.

Fifth, the results of this study make it clear that it is necessary to harmonize perceptions of physical and virtual reality. In digital learning activities, most of the objects for which digital tools are used are symbols, and not real, physical objects. Human experience is now greatly informed by the production and experience of digital artifacts, such as images, symbols, sounds, language, and motion, and the reactions to these processes and performances. Even though many reactions to digital inputs are not physically experienced by the body, human perceptions remain entirely capable of generating emotional reactions. However, the production, consumption and experience of digital artifacts is different from the process of adaptation or reaction in the real world. As understanding of digital literacy increases, humans as a whole continue to improve their ability to use digital tools, and digital artifacts produced through these means become increasingly sophisticated. But these skills are fundamentally different from an ability to adapt in real life. What learners do, learn, play, communicate, and produce on a digital platform is the result of learning how to operate and manipulate a program, with certain presets, rules, and parameters. As human beings refine their ability to create and operate programs on the basis of algorithms, the experience of using digital tools and creating environments is poised to contribute to the enhancement of learners' self-directed abilities. However, it is very important in digital literacy to think critically about the gap between the world of the program and the real world. Digital literacy is important for a number of reasons. It is both useful and can provide people that acquire it with great enjoyment, but there remains a gap between the digital and physical worlds, and the human body is often aware of this gap, even when the mind may not be. Teaching strategies should be established with an awareness of this point. Doing so will help us better participate in life and work in a rapidly changing, increasingly-digital society.

Ⅵ. Conclusion

This study examined the meaning of digital literacy and identified directions for digital literacy teaching design. Some degree of digital literacy is increasingly necessary in the social, professional, and recreational domains, and this study analyzed digital literacy from the perspective of interaction.

The qualitative case study performed in this work revealed the following.

In online digital literacy education, teaching using various digital communication generated a great deal of interactions. And digital communication designed to enable social interaction and knowledge-building was found to produce good educational outcomes by increasing adult learners' participation and enjoyment levels.

The study's implications can be summarized as follows.

Online digital literacy education must emphasize knowledge-building and social interaction. With regard to the process of learning based on the digital literacy, this study found that participant satisfaction was associated with a greater sense of presence. It was also influenced by the quality and quantity of collaborations, and more shared experiences. These experiences were characterized by creative learner-learner, teacher-learner, learner-content, and learner-interface interactions. Teaching methods that make use of these interactions require both pedagogical and andragogical approaches. Through digital interactions, learners can boost participation and social will even in virtual communities.

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논문접수일 : 2022년 02월 28일
논문심사일 : 2022년 03월 28일
게재확정일 : 2022년 04월 18일

요약

가상은 현실이다: 온라인 환경에서 학습과 디지털 리터러시

장지은 (성균관대학교)

코로나 19 팬데믹에 따른 비대면 사회생활의 확장 속에서, 본 연구는 '21세기를 살아내기 위한 스킬'로서 '디지털 리터러시'의 의미를 탐구하였다. 나아가 비대면 사회에서도 우리들의 활동이나 일을 가능케 하고 향후에도 필요로 되는 것으로서, 디지털 리터러시 교육방향을, 상호작용의 측면에서 탐색하였다.

본 연구를 위하여 저자는 한국의 지방자치단체 평생학습관에서 진행되는 디지털 리터러시 수업에 참여관찰을 하였고 교수전략, 상호작용의 두드러진 특징을 기록하였다. 또한, 프로그램이 종료한 후에는 개방형 비구조화된 설문지를 통하여 참여학습자들에게 수업만족의 주요요인에 대한 응답을 수집하고 분석하였다.

본 연구의 분석결과, 온라인 환경에서 디지털 리터러시 교육의 방향에는, 다음과 같은 시사점을 얻을 수 있었다. 디지털 리터러시 교육은 종래의 전달형 온라인 교육과는 달리, 온라인 공간에서도 지식의 구성과 사회적 상호작용을 중시하여야 한다는 점이다. 디지털 리터러시 학습 과정과 관련하여 참여자의 만족도는, 디지털 리터러시의 습득에 있어, 현장감, 협업과 협동의 질, 그리고 경험의 공유 등과 같은 상호작용의 실감에 관련되어 있었다. 나아가 이와 같은 경험은, 학습자-학습자, 교사-학습자, 학습자-콘텐츠, 학습자-인터페이스 등에 창의적으로 나타나 있었다. 그리고 성인학습임에도 불구하고 패다고지와 안드라고지의 교육원리가 적절히 반영되어 있었다. 이와 같은 디지털 리터러시를 기반으로 한 디지털 상호작용을 통하여 학습자는 온라인 공간에서도 참여와 사회적 의지를 고양할 수 있을 것이다.

[주제어] COVID-19, 디지털 리터러시, 비대면 교육, 상호작용, 티칭 디자인, 디지털 커뮤니케이션