

## Preservice teachers' digital access and reading comprehension of printed and hypertexts

With the technological advances in the world, education, no matter how conservative or traditional, will have to adapt to or adopt the onslaught of effects of advancing knowledge and skills using technology. With continuous upgrades in equipment, skills, and knowledge, educational stakeholders such as parents, teachers, students, and school administrators will have to widen the scope of their understanding and their use of the new technologies to be at par with the global scene.

Digital literacy is one development advent brought about by technology. O'Brien and Scharber (2008) defined digital literacies as "socially situated practices supported by skills, strategies and stances that enable the representation and understanding of ideas using a range of modalities enabled by digital tools" (p. 67). Though this definition provides a clear idea on what digital literacy is, it also brings out a lot of gray areas when the situation, skills, strategies, and stances mentioned are not described or specified. Even the term "digital tools" may lend itself to many interpretations. Borawski (2009), citing the ICT Literacy Panel, defined digital literacy as "using digital technology, communication tools, and/or networks to access, manage, integrate, evaluate and create information in order to function in a knowledge society" (p. 53).

Eshet-Alkalai and Chajut (2009) were more general and vague in defining digital literacy which they conceptualized as "the ability to employ a wide variety of cognitive and emotional skills in using digital technologies" (p. 713). This definition does not just consider the mental processes that one utilizes in dealing with technology but also the affective operations that one practices during engagement with technology. This would be further detailed by Eshet-Alkalai's model of digital literacy as cited by Eshet-Alkalai and Chajut (2009, p. 713) consisting of six skills: (a) *photovisual* literacy which refers to the ability to work effectively with digital environments such as the interface that employs graphical communication; (b) *reproduction* literacy which is the ability to create authentic and meaningful written and art work by reproducing and manipulating pre-existing digital texts, visuals, and audio pieces; (c) *branching* literacy which is the ability to construct knowledge by a nonlinear navigation through knowledge domains such as the Internet and other hypermedia environments; (d) *information* literacy which is the ability to consume information critically and sort out false and biased information; (e) *socioemotional* literacy which is the ability to communicate effectively in an online communication platform such as discussion groups and chatrooms; and (f) *real-time thinking skills* which are the ability to process and evaluate large volumes of information in real time such as in computer games and chatroom. These skills detailed by the model give a bigger picture of what can be achieved using technology as a medium for reading and writing. The list of digital literacy definitions, however, still remains inconclusive because as new software, programs, devices, and gadgets are introduced to the market every year consumers are presented with new ways of managing them. There seems to be no stopping the speed at which technology is shifting.

*There is also a third force we believe will be central to defining the nature of literacy instruction in the next millennium: Literacy is regularly changing as new technologies for information and communication continuously appear and as new envisions for exploiting these technologies are continuously developed by users. It is becoming increasingly clear that we are in a period of rapid technological change; technologies in nearly every field are undergoing fundamental change on a regular basis. (Leu & Kinzer, 2000, pp. 116-117)*

Despite its elusiveness to some, digital literacy cannot be ignored since its practices are evident among students (Hargittai & Hinnant, 2008 citing Fox & Madden, 2005 & Madden, 2003). When they open their computers, laptops, tablets, and mobile phones, they easily shift to their skills in using technology. Undeniably, whether students send e-mails, write texts in their short messaging system (SMS), or read e-mails, blogs, messages and posts, they utilize their reading skills.

What then is the extent of reading using digital tools? The case study of Rowsell and Burke (2009) identified reading in the lens of multimodality which means "the use of different modes of communication to create an effect, the point being that each mode offers certain potential meanings that another might not offer" (p. 107). This multimodality is already seen in the students' way of life as they easily manage their interaction with the screens of their devices. They chat with people using the keyboard or the microphones of their headsets and listen to voices using their ear "buds" or plugs or speakers of varying styles and sizes. As they chat, they manage to open other websites by creating a smaller space for the person they are currently engaged in. They traverse through various pathways that the internet provides them. Multimodality is now central to the literacy practices of youth and adults in the globalized communication environment (Mills, 2010).

Saljo (2010, p. 56) says that "one of the main consequences of why these technologies are significant is that they affect the manners in which the society builds up and provides access to memory, that is, the pool of insights and experiences that people should know about and to make use of...technology does not facilitate or improve learning in a linear sense, rather it is currently changing our expectations of what learning is

and changing our expectations about what it means to know something.”

Technology, particularly digital access, and reading, particularly reading comprehension, are variables that have to be considered then in digital literacy. Technology which is made available to individuals in terms of motivation access, materials access, skills access, and usage access (Van Dijk, 2005) must be addressed. These types of digital access play important roles in digital literacy. Reading comprehension on one hand is compromised as new types of texts emerge as far as digital literacy is concerned. Traditional concepts on texts would refer to anything that is printed. In Hermosa’s report (2002) on levels of comprehension, texts may be comprehended at the literal, interpretive, evaluative, integrative, and critical levels. Sweet and Snow (2002, pp. 23-24) defined reading comprehension “as the process of extracting and constructing meaning through interaction and involvement with written language”; eventually, with the event of digital literacy, comprehension was later construed as “extracting and constructing meaning from texts” (Sweet & Snow, 2002, p. 25) excluding the term “written.” “Text is broadly construed to include any printed or electronic text” (Sweet & Snow, 2002, p. 25).

Thus, texts are no longer confined to print but may be characterized in several ways in the light of digital literacies. O’Brien and Scharber (2008) positioned that “digital literacies include the composition and reading of *multimodal* texts. In multimodal composing and reading, ideas and concepts are represented with print texts, visual texts (photographs, videos, animations), audio texts (music, audio narration, sound effects), and even dramatic or other artistic performances (drama, dance, spoken word).”

Reading in print and reading in hypertext have become interesting topics for research as indicated in the studies of Foltz (1992), Fontanini and Tomich (2009), and Bolaños (2009). Bolaños’ study brings the investigation closer to home as he focused on university students in the Philippines as his respondents.

The role of technology in reading and reading comprehension continues to expand as new developments in technology emerge. Kamil and Chou (2009) identified that one of the most important developments in federal regulations in the United States was the requirement that all textbooks be made available in electronic format as promulgated by the National Instructional Materials Accessibility Standards (NIMAS). The order is for all books published on or after July 19, 2006. “Given all instructional materials will have to be available in electronic format suggests that far greater computer use in instructional materials is just on the horizon” (Kamil & Chou, 2009, p. 297).

In view of the foregoing definitions and predictions, what needs to be investigated, too, would be the type of comprehension that is achieved. In the fast-paced world of technology, can it be assumed that comprehension is gained much faster? What skills or strategies are required in gaining information from the internet and ICTs?

Leu, Kinzer, Coiro and Commack (2004) asserted that “reading comprehension is likely to be a major area of investigation because the Internet and other ICTs focus so

much on information and learning from text” (p. 1602). Comprehension, being the main goal of reading, is defined as “the process of simultaneously extracting and constructing meaning through interaction and involvement with a written language” (RAND Reading Study Group, 2004). This process which traditionally involved written language alone (as provided in the definition) has emerged beyond the written language. The interactions with the computer, with information on the internet and other ICT-related medium, are no longer confined on paper but have emerged on the screen where a mere touch or tap will provide other sites and other forms of the language that will require possibly new dimensions in “extracting and constructing meaning” (RAND Reading Study Group, 2004). Furthermore, learners should be taught internet comprehension as Leu, Coiro, Castek, Hartman, Henry, and Reinking (2005) launched the Teaching Internet Comprehension to Adolescents (TICA) project which aimed at improving reading comprehension by recognizing the role of the internet in reading development.

As Tierney (2009) suggested in his discussion on comprehension within and across digital spaces:

*As we move across or within networks and web-like engagement, we are sifting, linking, sampling, following leads and paths at the same time as we are doing forms of layering and affiliating as we pursue for ourselves and others confirmation, understanding, plans, commitments, answers, directions or acknowledgements. Those researchers examining the cognitive strategies involved in meaning making on-line bring to the fore the importance of several strategies which may be somewhat nuanced in the networked environment – the importance of refining searches, forward inferencing (akin to predicting), making linkages and other integration in a fashion that coheres and is simultaneous linking ideas together (texts, images, sounds) as the meaning maker(s) refine(s) or expand(s) understandings at the same time as they evaluate them and assess coherence. (p278)*

## REVIEW OF RELATED LITERATURE

### *Digital Access*

Digital divide is defined as lack of access to information technology (IT) (Servon, 2002) and the gap between people who have access to information and communication technologies (ICT) and those who do not, an issue of significant social justice (Quibria, Ahmed, Tschang, & Reyes-Macasaquit, 2003; Atkinson, Black, & Curtis, 2008; Petcu, Gherhes, David, & Suci, 2010). When the label “digital divide” slowly found its way to the world in the 1980s, the divide was basically focused on physical access. The division was focused on those who had computers and those who did not. First world countries were considered to have the advantage of having greater opportunities to acquire technology, leaving developing countries trailing behind them. The former had the resources to purchase or develop the hardware and the software while the latter would have to depend either on hand-me-downs or donations from first world countries.

Recent studies, however, have shown that access has gone beyond physical. Ownership of or access to ICT does not necessarily mean success in the digital world. "When the internet diffused rapidly into society and became a primary type of computing, the term shifted to encompass gaps in not only computer but also internet access (van Deursen & van Dijk, 2010, p. 893)." The speed by which technology has changed since the introduction of computers to the present time has moved by leaps and bounds. Access has to be redefined to meet the needs of the changing times. Since then, several studies have yielded new definitions for the term "access."

Valadez and Duran (2007) defined digital divide beyond simple access by identifying four elements of access to C & I (computers and the internet): 1) physical access, 2) C & I use in the classroom, 3) availability of support for C & I, and 4) social consequence of the use of IT. Van Deursen and van Dijk (2010) elaborated on the range of internet skills by proposing 1) operational internet skills which are derived from concepts that indicate a set of basic skills using the internet technology; 2) formal internet skills which relate to the hypermedia structure of the internet which requires the skills of navigation and orientation; 3) information internet skills which are derived from studies that adopt a staged approach in explaining the actions via which users try to fulfill their information needs; and 4) strategic internet skills which comprise the capacity to use the internet as means of reaching particular goals and for the general goal of improving one's position in the society.

In the Philippines, Rodrigo's study (2005) concentrated on quantifying the digital divide in Metro Manila by comparing it with those in other countries, particularly the International Association for the Evaluation of Educational Achievement (IEA)-surveyed countries which included Norway, Canada, Japan, Italy, New Zealand, France, and China among 24 other countries. Compared to those in most countries, public school students of Metro Manila were found to be highly marginalized in terms of access to the internet for instructional purposes and computer-hardware availability though they fare well in software use (Rodrigo, 2005).

Will there be a chance for the divide to close? Servon (2002) debunked four myths concerning the digital divide. First, providing access to computers and the internet will eliminate the digital divide; second, technology can solve social problems; third, on-line communication diminishes the need for face-to-face contact; and, lastly, IT levels spatial inequalities. She asserted, however, that the digital divide was a symptom of a much larger and complex problem – poverty and inequality; thus, closing the gap would require longitudinal studies concerning a wider scope of variables. Hargittai and Hinnant (2008, p. 618), whose study focused only on internet connectivity of young adults, reported that "simply being connected will not necessarily solve all potential sources of inequality, and so studies of more nuanced uses of the Web are important as Internet use spreads to an increasing portion of the population." James (2008, p. 60) argued that the concept of diminishing the digital divide was unlikely "without much government intervention and without taking cognizance of views that emphasize how the initial advantages conferred on rich countries systematically tend to disadvantage poorer countries. Van Dijk as cited by Van Dijk

and Hacker (2003, p. 324) argued that "in the present epoch several trends come together to promote information inequality: social and cultural differentiation or individualization, rising income differentials, privatization and cutbacks in social and public services, and, finally, increasingly multifunctional and differently used digital technology." Thus, measuring the divide and closing the gap will require a longer period and a more extensive study of factors.

There are claims, however, that the digital divide can be bridged through several means. Open access is being considered as a solution to problems in accessing knowledge in Africa thus narrowing the divide. Citing Bethesda Meeting on Open Access publishing, Ahmed (2007, p. 339) defined open access as: "The author(s) and copyright holder(s) grant(s) to all users a free, irrevocable, world-wide, perpetual right of access to, and a license to copy, use, distribute, transmit and display the work publicly and to make and distribute derivative works, in any digital medium for any responsible purpose, subject to proper attribution of authorship, as well as the right to make small numbers of printed copies for their personal use." This initiative is important because free access to scientific information will enable users to increase their knowledge and skills. Gbenga-Ilori and Ibeyami (2010) suggested that the use of digital dividend, in particular the transition to digital television broadcasting, the use of wireless internet access, and the affordability of devices, will decrease the digital gap in rural and urban areas in Nigeria.

Despite the great challenge, schools play a great role in filling the gaps. Quibria, Ahmed, Tschang, and Reyes-Macasaquit (2003) reported that "the relationship between computer usage and education is statistically significant at the 1% level with tertiary education" (p. 816). Additionally, "education is a strong complement to Internet and the relevant educational levels are secondary and tertiary levels as they are expected to upgrade the national capacity levels for adaptation and innovation" (Quibria, Ahmed, Tschang, & Reyes-Macasaquit, p. 819). Thomas (2008) also supported the idea that schools had the responsibility for closing the gap in the knowledge portion.

Barone and Wright (2008, pp. 292-293), citing Leu et al. (2004), cautioned that before bringing technology in the classroom the following points should be considered:

- Simply using software programs on computers does not prepare students for new literacies' expectations.
- New literacies are deictic in that they constantly change and require teachers to embrace these changes.
- New literacies are essential in classrooms so that equal opportunities are offered to all students.

## DIGITAL ACCESS AND READING

Recent studies have delved into the relationship of digital media, including digital skills, and reading. Terms such as digital literacy, digital texts, on-line texts, hypermedia, and hypertexts have been closely associated with reading in general. The following studies yielded interesting results on whether the digital divide which includes these media has created an impact on reading or no.

A Canadian study among 15-year-old youth yielded noteworthy results on the use of information and communications technology and reading achievement. Addressing the issue on the relationship between computer use and reading achievement, Thiessen and Looker (2007) initially saw no linear relationship between the two variables but identified a pronounced curvilinear effect using the hierarchical linear modeling. What could be more remarkable in their findings would be the assertion that ICT use was related to higher reading achievement only to a point, and once this optimal point had been reached, “the relationship shifts to a negative one” (pp. 175-176). Thus, the overuse of ICT in schools may just not be the answer to improving academic performance of students. Monitoring of ICT use by school heads and parents will have to play a big role in ensuring that students do not go beyond the optimum level. These assertions provide another intricacy to the seeming complex relationship of ICT and reading achievement.

The future of reading and writing is predicted to be significantly affected by digital texts. Bromley (2010) forwarded the following ideas: 1) pens, pencils, and paper will soon be artifacts of the past; 2) electronic reading and writing will be pervasive, collaborative, and social events; and 3) speech will replace most writing. In preparing for the future, instruction should accept the place of digital literacy, teach critical visual literacy, encourage and recognize digital creations as valid demonstrations of literacy, impart knowledge on what plagiarism is, be more sensitive to students’ activities beyond the classroom (which normally includes the use of the internet), and provide tasks that will be aligned with these out-of-school activities.

The television and the internet, which have long been identified as part of the digital world, have been investigated in relation to reading. Griswold, Mc Donnell and Wright (2005) implied that television had replaced reading while it was the opposite for the internet. While television has displaced reading time, the internet directly supports reading and vice-versa because the internet enhances further reading. Watching television has been a habit that has replaced reading for some, but internet-use which requires reading (to be defined differently from text reading) has improved reading time and reading skills. These findings, if true, could complement another investigation. Mokhtari, Reichard, and Gardner (2007), in investigating college students, identified internet use to be taking more of students’ time. However, the study differentiated internet use from academic reading, recreational reading, and watching television. Using email and chatting garnered the highest rating in terms of internet activity. The authors cautioned, however, that their findings needed to be investigated further since overlapped in the activities were observed, and, although internet use was the leading activity, it did not necessarily translate to reading and writing as reading was given a separate category.

Flippo (2011, p. 398), citing Pawan and Honeyford, had this to say concerning digital technology and reading:

*Technology has made it much easier for all of us to be a part of the knowledge authorship and creative process; to engage in multi-modality, at multiple levels across disciplines; to have access to multiple perspectives; and to juxtapose our experiences in and out of school. However, unless students take*

*the capabilities and opportunities created by the new media to cultivate a sense of who they are as students and what they bring to academic literacy communities, the students will be subject to the literacy judgment and agendas by others...how literacies are used is the determining factor between those who are successful and those who are left behind in academia. (p. 41)*

Citing several other authors who studied high school and college reading, Flippo (2011, p. 398) concurred “that the scope and breadth of these new literacies are constantly growing and changing, which needs to be reflected in our classrooms.” Despite the methodological challenges in reviewing much of the research on computer instruction and reading, new generations of computers, software, learning theories, and new approaches to classroom instruction suggest that computers might have a different role to play today than they did a decade or two ago (Kamil & Chou, 2007).

In Nepal, Pandey (2006) interweaved the political history of one’s culture with literacy and the digital divide. Recounting his own experiences, Pandey described details of his education, the political activities of the time, his encounters with printed and digital texts, and the access to digital information and communication. He realized that the interplay of these variables was so complex that achieving literacy was a constant negotiation.

Finally, Bolaños (2009), in investigating good L2 readers in a Philippine university, found that good readers, whether reading print or hypertext, utilized a variety of coordinated strategies. The study also uncovered that comprehension was not affected by the two types of reading environment. Findings showed that better comprehension was achieved the more reading strategies the students utilized .

## METHOD

The research made use of a quantitative design. The investigation quantitatively explored the data gathered using online and paper survey and online and paper reading tests.

## PARTICIPANTS AND LOCI

Students from selected teacher education institution (TEIs) in Luzon were randomly chosen as respondents of the study. The institutions were chosen based on several inclusion criteria. They should: 1) offer bachelor’s degree leading to education, 2) offer education programs for the last ten (10) years, and 3) have university status. Five universities from the National Capital Region (NCR) and one from Region 1 were requested to participate in the study. Four universities positively responded to the written request and thus were identified in this study as University A, B, C, and D. University A and University D represent private school institutions and are both sectarian and run by religious groups. Universities B and C, on the other hand, are state-funded universities. Two universities are in the NCR, one is in Pampanga (Region 3), and one is in Cagayan (Region 2).

Respondents from universities came from various majors or disciplines (e.g., Mathematics, English, Science, Social Science, Special Education, Elementary Education). Students from the second year, third year, and fourth year levels were

chosen based on the availability of the respondents and the approval of the deans/administrators of their institutions. Students from these levels were chosen because it was assumed that they had already acclimatized themselves in the university and they had enough experience concerning the reading demands of college life. In total, 332 students participated in the study. The number, however, varied in certain variables due to the missing answers of some respondents and was reduced to 297.

Table 1. Respondents' profile (n=332)

Gender	F	%	Status	F	%
Male	62	20.1	Single	296	97.7
Female	247	79.9	Married	7	2.3
Skipped	23				
Age Range			Type of School		
16-18 years	129	42.6	Private	121	39.5
19-21 years	147	48.5	State/Gov't	185	60.5
22-24 years	19	6.3			
25 and above	8	2.6			

As indicated in Table 1, the majority of the respondents were female at 79.9% (247), and the rest were male at 20.1% (62). Almost all the respondents were single (97.7%), and the majority were aged between 19-21 years old. Most of them were studying in state-run universities (60.5%) at the time of this investigation.

Table 2. Respondents' family income (n=297)

Monthly Family Income	F	%
P0-50,000	219	73.7
P51,000-100,000	38	12.8
P101,000-200,000	19	6.4
P201,000-300,000	12	4.0
P301,000-400,000	3	1.0
P401,000-500,000	2	0.7
P501,000-1M	2	0.7
P1M and above	2	0.7
Total	297	

The monthly income of most respondents fell under P50,000.00 as could be gleaned from Table 2. This indicated that most were living in the low income bracket. Respondents in the P51,000-100,000 bracket were 12.8% of the

respondents, followed by the P101,000-200,000 income bracket with 6.4% of the participants; the P201,000-300,000 income bracket with 4.0%; and the P301,000-400,000 income bracket with 1.0%. The respondents in last three income brackets (P401,000-500,000, P501,000-1M and P1M and above) constituted 0.7% each of the total.

Table 3. Respondents' grade/year level and number per university

	f	%		f	%
First	2	0.7	University A	40	13.2
Second	113	37.5	University B	73	24.09
Third	178	59.1	University C	86	28.38
Fourth	8	2.7	University D	104	34.32
	301	100		303	100

Although some respondents skipped the question on the name of their universities and their year levels, Table 3 shows that the bulk of the respondents came from University D where 104 (34.32%) students participated; then University C with 86 (28.38%); followed by University B with 73 (24.09%); and University A with 40 (13.2%). It was also worth noting that there was a preponderance of second year (37.5%) and third year students (59.1%) among the participants. There were only 8 (2.7%) fourth year students and 2 (0.7%) first year students.

Non-probability sampling, particularly judgmental or purposive sampling, was chosen in the light of the fact that this sample group had relevance or value. This type of sampling was used for two reasons. First is this type of sample is used "to deal with situations where it is impossible or very costly to identify a particular population"; it is also utilized "for selecting some cases of a particular type" Blaikie (2010, p. 178). "Defining a population in this way may restrict statistical generalizability of the results, but the richness of the data may allow generalizations based on a judgment about how typical the chosen research site is, or whether other suburbs in other cities are similar in important respects" (Blaikie, 2010, p. 177). "The primary consideration in purposive sampling is your judgment as to who can provide best information to achieve the objectives of your study...this type of sampling is extremely useful when you want to construct a historical reality, describe a phenomenon or develop something about which only little is known" (Kumar, 2009, p. 207). This is further supported by Polkinghorne (2005, p. 140) citing Patton: "information-rich cases are those from which one can learn a great deal about issues of central importance to the purpose of research, thus the term purposive sampling."

## INSTRUMENTS

There were four instruments used in the study: the online reading comprehension test, the paper-and-pencil reading comprehension test, pen-and-paper digital access survey anchored on Van Dijk (2005) and Leu et al. (2011), and the interview guide. The first tool to be administered bore the

agreement clause between the researcher and the respondents. Once the respondent agreed to participate in the research, he/she had to affix his/her signature in the survey tool.

### Digital Access Survey Tool

All the instruments were pilot-tested before their implementation. The digital access survey tool was anchored on the framework of Jan Van Dijk (2005) and Leu et al. (2011). Using the framework of Van Dijk, four types of access were identified: motivational access, material access, skills access, and usage access. Items were created to flesh out the types of access following a four-point Likert scale with the following descriptors: 1-low access, 2-moderate access, 3-much access, and 4-full access.

### Reading Comprehension Test for the Typography and Hypertext

After the survey, respondents were given a reading comprehension test. The test was a pen-and-paper type. The informational text used for the typographical text was "The Possession of Malacañan Palace" from <http://malacanang.gov.ph/1582-the-possession-of-malacanan-palace/>. The article was subjected to the Flesch-Kincaid level guide, and the result showed it to be at 14.6 level, meaning Grade 14 or referring to college sophomore level. The Flesch-Kincaid reliability test, available in the Microsoft Word Program of 2007, was used to determine the appropriateness of the materials to their readers. The Flesch-Kincaid is a well-established, reliable, and valid tool to evaluate the complexity of any document (Curriculum Evaluation California State University, Chico, 2009, p. 21). DuBay (2004), citing Edgar Dale and Jeanne Chall, defined readability this way: "The sum total (including all the interactions) of all those elements within a given piece of printed material that affect the success a group of readers have with it. The success is the extent to which they understand it, read it at an optimal speed, and find it interesting." The reliability results should be between Grade Levels 10 to 16.

The test for the hypertext following the framework of Leu et al. (2011) was adopted from the Digital Divide Measure Survey (DDMS) for Teachers of Henry (2007). Henry's dissertation titled, *Exploring new literacies pedagogy and online reading comprehension among middle school students and teachers: Issues of social equity or social exclusion?*, made use of an online survey and reading test that evaluated the students' and teachers' reading comprehension using hypertexts. The DDMS for students was crafted for middle school students while the DDMS for teachers was developed for their teachers. Communication with Dr. Henry through email was initiated, and, after several e-mail exchanges, Dr. Henry proposed communicating via Skype. With permission from Dr. Henry, the DDMS was used to measure the hypertext comprehension of the students.

## RESULTS AND DISCUSSION

### Digital Access

The digital access questionnaire was divided into two areas following the models of Van Dijk and Leu et al. Data obtained from Van Dijk's model (DA1) concentrated mainly on the access based on motivation, material, skill, and usage while

Leu's model (DA2) considered the skills necessary for nonlinear reading which included the following: locating the search engine, locating information, evaluating information, synthesizing information, and communicating information.

Table 4. Digital access results

	Mean	SD (Standard Deviation)	Skewness
DA1	2.68	.68	-.080
DA2	2.70	.60	-.140
Average	2.70	.58	-.140

Table 4 shows that the results for digital access following Van Dijk and Leu's models were converging toward an almost common mean. In terms of dispersion, however, the digital access scores of Leu's model were more dispersed at .68 than that of the other model. This indicated that respondents may have access to digital technology in terms of materials, motivation, skill, and use, but their digital access to technological skills varied. Based on the average answers of the respondents, a mean score of 2.70 was arrived at. This indicated that the majority of the respondents had moderate digital access. With an SD of .58, respondents were less dispersed and more homogenous. Results also indicated that there were more scores above the mean as indicated in the skewness values in Table 2.

It is suggested that the respondents get used to technology and its use. Although access begins with motivation towards the use and acquisition of digital materials, it does not define the learning of individuals with technology. Still, the essential nature of the digital divide cannot be measured by tallying hardware. Rather, it must be measured by determining access to rich learning experiences in which technology is embedded (Goode, 2010, p. 586). Digital access has to be further investigated among the student-teachers given that there are other factors that might have affected their access.

Table 5. Digital access based on Van Dijk's model

Types of Access	Mean	SD
Motivational	3.03	.71
Material	2.52	.79
Skills	2.87	.78
Usage	2.49	.75

Table 5 clarifies further the type of access according to the perception of the respondents. Motivational access had the highest mean, indicating that most respondents were highly driven to use digital tools in reading. They reported that they had high skills as skills access took second place in the table. Materials' availability was quite moderate, however, at 2.52 which somehow affected usage which was at 2.49. Results confirmed that respondents had high inclination towards technology, but due to less material access their skills and usage decreased thus resulting in only moderate access. Van

Dijk (1999) as cited by Van Dijk and Hacker (2003, p. 316) strongly advocated that the first two types of access be resolved, wholly or partially, so that “the problems of structurally different skills and uses become more operative.”

### Digital Access and Reading

As indicated in Table 6, there was correlation between digital access and the comprehension of the linear text with a result of .148 at the  $\alpha < 0.5$  level. This correlation between digital access and linear or printed text can be attributed to some other factors like the use of digital access to be able to get the printed texts. This correlation can also be explained by Bolaños’ study (2009) which showed that reading strategies, particularly of good readers, regardless of linearity or nonlinearity, were factors that should be given great value. Thus, preservice students could have used their reading strategies to navigate between digital access and printed text.

Table 6. Significant relationship between digital access and linear text reading comprehension result

Digital Access	
Typography	.347**
Hyperext	.148*

\*\*Correlation is significant at the  $\alpha < .01$  level (2-tailed)

\*Correlation is significant at the  $\alpha < .05$  level (2-tailed)

It was not a surprise that nonlinear text had a strong relationship with digital access at .347 at the  $< .01$  level. This can be explained by the fact that digital access plays an important role in the comprehension of nonlinear texts since it provides the medium and resources for the text. Digital access 2 or Leu’s model obtained greater impact accounting for the skills that should have been used in taking the reading comprehension test. At .334 significance, DA2 revealed that *Locating information by using a search engine and its results page, Locating information within a website, Critically evaluate information, Synthesize information and Communicate information*, which were skills necessary to read the hypertexts, could determine the success for reading hypertexts.

### CONCLUSIONS AND RECOMMENDATIONS

Jan Van Dijk’s theory on digital access is sound. As indicated by the results showing the succession of access and self-report of the respondents concerning their use of technology, motivational and material access must first be resolved before skills and usage access become operational. In the case of the study, there is moderate access to technology especially in the first two types of access. This is translated, too, even in skills access using Leu et al.’s framework. This is an indication that in pre-service education the access of students to computers and internet connection has not been maximized. Material access has to be emphasized initially because without this initial access other types of access cannot be initiated. Strong motivation is evident among those interviewed as exemplified in their experiences (going to computer/internet shops to get

information or using their cell/mobile phones to download information); however, if schools and homes are unable to provide initial access, it will be harder for participants to get better access in terms of skills and usage.

Though a relationship was established between digital access and typographic text comprehension scores, this relationship was not seen as causality since further test revealed that digital access had no impact on the linear test. Impact was found for digital access on hypertext reading comprehension test results. This result confirmed that the medium (typographic text and hypertext texts) played a significant role in the reading comprehension process.

The investigation yielded results that would benefit students, teachers, and administrators. Students should be exposed more to reading materials beyond the traditional typography, and their fascination with technological gadgets should be directed towards enhancing their skills in reading. Teachers and administrators should be aware of the changing landscape of reading which now considers technological advances in reading materials. This new literacy should be taught, and schools should be able to address this need. Research on digital access and reading may be expanded to include other fields of specialization beyond education. Other disciplines such as social science, arts and humanities, philosophy, mathematics, and science should also be considered for further research.

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