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The Invention of Reading and the Evolution of Text

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Abstract: While societal interpretation of reading has evolved over millennia, the functions of reading appear to transcend time and place; reading provides individual access to accumulated cultural experiences, knowledge and information. Historically, numerous innovations have increased access to text and such increased access is both the cause and the consequence of continually increasing societal expectation that individuals can and will read. Although a relatively recent innovation, digital technology has had a profound effect on the production and decoding of written text. Digital technology devices, it is argued, contribute to the evolution of text thereby ensuring increased use of the invention of reading.

Volume 16, Number 1: May 2015
ISSN: 1535-0975

Reading is a general term used to refer to the processes of deriving meaning from abstraction or symbolic representation. Reading English text, for example, requires deriving meaning from 26 symbols (i.e., the alphabet) presented in seemingly infinite combinations (e.g., sentences and paragraphs) and organised with 14 other print symbols (i.e., punctuation marks) and several text conventions (e.g., space between words and paragraph indents). Although reading is not possible without a system of writing, Fischer (2003) described writing as the antithesis of reading. Writing is a skill; reading is a faculty. Writing is expression; reading is impression. Writing is public; reading is personal. "Writing was originally elaborated and thereafter deliberately adapted; reading has evolved in tandem with humanity's deeper understanding of the written word's latent capabilities" (p. 8).

A reciprocal and spiralling relationship exists between personal reading opportunities, reading requirements and reading abilities. That is, the more that text is available, the greater the social expectation that individuals will read (Hellinga, 2009). Simultaneously, the more that reading is required, the more attention placed on reading, the greater the level of literacy in the general population and the greater the concern for those who cannot read. Historical analysis of the human activity of reading demonstrates continuous progress or, according to Fischer (2003), "successive stages of social maturation" (p. 8). While once the domain of a privileged few (Finkelstein & McCleery, 2005), individual ability to read and access text are currently considered fundamental to personal and social progress (Organization for Economic Co-operation and Development, 2013).

A Brief History of Reading and Writing

Spoken language is a natural evolutionary human phenomena; written language is a human invention (Pinker & Bloom, 1990). According to Aristotle (384-322 BC), spoken words are the

Volume 16, Number 1: May 2015
ISSN: 1535-0975

symbols of mental experiences; written words are the symbols of spoken words (Modrak, 2001). Although reading and writing are distinct processes, the invention of a system of written symbols was prerequisite to the invention of reading. Some 6000 years ago, "the world's first active readers sighted only a bare skeleton of text (name, commodity, amount), the control of which served to empower an oligarchy" (Fischer, 2003, p. 17). In 2000 BC, the Phoenicians developed the first alphabet consisting entirely of consonants. One thousand years later, the Greeks added vowels to the alphabet (Daniels, 1996). Punctuation marks appeared as early as the 2nd Century BC. In 900 AD, the insertion of spaces between words facilitated the ease with which text could be read (Houston, 2013). While obvious from a contemporary perspective, spaces between words constituted a major innovation because considerably less effort and training were required to decode written text thereby rendering reading processes more personally accessible. Currently, consonants, vowels, punctuation and spacing remain the basic conventions from which meaning is derived when reading English text (Powell, 2009).

In addition to the evolution of written symbols and conventions which made reading increasingly accessible, social expectations and assumptions about reading correspondingly evolved (Finkelstein & McCleery, 2005). Ancient historians note that "all early 'reading' involved very simple code recognition, and was invariably task-oriented" (Fischer, 2003, p. 17). In this regard, those individuals who could read simple records (e.g., name, commodity and amount) held considerable economic and social importance. An element of trust, if not prestige, was necessarily associated with those who could read. Similarly and over time, increasingly complex written text permitted public oration of narratives and accounts that were once entirely dependent on human memory and corresponding recitation (Moorhead, 2011). For example, popular access to biblical stories was once limited to public recitation from clergy memory.

Volume 16, Number 1: May 2015
ISSN: 1535-0975

Increased reading ability among the general population increasingly negated the once essential skill of extensive memorization while simultaneously increasing public demand for text and individuals who could read that text.

Historically, the mechanisms by which written symbols were transcribed had a reciprocal and spiralling impact on the evolution of text. For example, innovations in writing material made texts more available and reading more common. In the 4th millennium BC, small clay tablets were used for record keeping but quickly increased in size to allow for more inscriptions, decreased in weight for ease of handling and improved in terms of writing properties for ease and permanence of inscription (Robson, 2009). By 2900 BC in ancient Egypt, the papyrus plant was processed to produce rolls of a paper-like material that were relatively amenable to enduring inscription, transportation and storage (Roemer, 2009). As early as the 9th Century BC, the Romans crafted reusable wax-covered wooden tablets for record-keeping and ethereal writings (Fischer, 2003). By the 2nd Century BC, the ancient Greeks read from parchments made of animal skins, expensive but highly portable and durable (Finkelstein & McCleery, 2005). Paper was invented in China during the 1st Century AD and text was printed on that paper by woodblock primarily to diffuse Buddhist teachings (Edgren, 2009). In the 15th Century AD, the printing press accelerated the production of reading material and thereby accelerated the extent to which individuals read (Hellinga, 2009). Nonetheless, despite the continually increasing availability of reading material and the associated increased levels of literacy in many societies, the functions of reading have remained relatively constant throughout history and, indeed, into the present.

The Functions of Reading

Volume 16, Number 1: May 2015
ISSN: 1535-0975

The evolution of complex oral language increased human survival because it improved food supply which contributed to increased brain size (Dunbar, 2003). Increased brain size allowed for increased oral language and increasingly complex social organization. The Neolithic agricultural or farming revolution resulted in the trade, storage and distribution of food which required increasingly complex record-keeping, -- the first form of reading in the modern sense (Fischer, 2003). Further, the agricultural revolution improved food supply which allowed for decreased focus on survival and increased focus on creative and recreational activities such as story-telling (Steckel & Wallis, 2011). Large dense brains, relatively stable food supplies, oral language abilities and opportunities for creative activities resulted in increasingly complex cultures among human groups which included shared understanding and experiences of, for example, religion and history (Shackelford & Liddle, 2014). Those who could read text were at a survival advantage because they had access to a record of accumulated human experiences, interpretations and understandings (Finkelstein & McCleery, 2005). Historically, social repression has been achieved and maintained by denying groups of individuals the right to learn to read. For example, legislation in 1830 in the United States of America stated:

> Be it enacted by the General Assembly of the State of North Carolina, and it is hereby enacted by the authority of the same, that any free person who shall hereafter teach or attempt to teach any slave within this State to read or write, the use of figures excepted, shall be liable to indictment in any court of record in the State having jurisdiction thereof, and upon conviction shall at the discretion of the court if a white man or woman be fined not less than one hundred dollars nor more than two hundred dollars or imprisoned (North Carolina Digital History, 2009).

Volume 16, Number 1: May 2015
ISSN: 1535-0975

Increased individual access to the invention of reading represented increased individual access to cultural knowledge and associated power. Nickerson (2005) suggested that human inventions, ‘‘as amplifiers of human capabilities’’ (p. 3), are meaningfully organized as increasing motor capability (e.g., moving large object), sensory capacity (e.g., viewing astronomical phenomena), or cognitive ability (e.g., storing information). For example, Johnson (2008a) concluded that the invention of internet search engines (e.g., Google) represents an extension of human cognitive ability. In her large sample, “students who reported frequently using search engines scored significantly higher on the measure of metacognition (i.e., planning) than students who infrequently used the same cultural artefact” (p. 2104). Tsai (2004) described search engines as metacognitive tools that help individuals ‘‘select and filter information’’ (p. 526). With regard to this, a specific internet application (i.e., search engines) may be conceptualized as amplifying a specific metacognitive function (i.e., locating relevant information). From such a perspective, the continually increasing complexity of human inventions or cultural tools reflects continual improvement in human cognitive sophistication (Maynard, Subrahmanyam, & Greenfield, 2005). Denying a group of people access to a popular cognitive tool (e.g., reading and search engines) is equivalent to denying that group to opportunities to grow intellectually.

Reading extends human oral communication and, since language is a cognitive function, extends human intellectual capacities. Historically and currently, humans read text for the same reasons that humans listen to others speak, -- that is, to access information and participate in culture. Restated, people communicate (i.e., write-read, speak-listen, gesture-view) to benefit from connection with others (directly or indirectly). In general, to access information and participate in culture is to learn; to access information and participate in culture is the essence of

Volume 16, Number 1: May 2015
ISSN: 1535-0975

social connection, a seemingly fundamental human motivation essential to individual survival and social development (Shackelford & Liddle, 2014). Historians note that ancient text was "recognized to be an invaluable tool for accumulating and storing information" (Fischer, 2003, p. 17). Digital tools (e.g., computer hard drives) currently have the same function, but to a much greater degree (Johnson, 2008b). "The Internet has become a primary form of external or transactive memory, where information is stored collectively outside ourselves" (Sparrow, Lui, & Wegner, 2011, p. 776).

Human communication, which includes literacy, is a cultural tool in continued use and, as such, it continues to evolve. To illustrate, telescopes and microscopes continually increase their capacity to see objects that are further or smaller; airplanes continually increase their capacity to move more passengers and cargo faster; computers continually increase their capacity to hold more data and provide more functions while continually decreasing in size; but hand powered farming tools stopped improving as they became increasingly obsolete. As with the evolution of all human inventions or cultural tools, extremely crude and rudimentary forms of reading and writing were invented and continuously evolved to improve communication. It is naive to assume that existing writing conventions such as vowels, punctuation marks and spacing between words and paragraphs are the point at which evolutionary processes will cease. Evolution ceases as species move toward extinction or, in the case of cultural tools such as reading, with disuse. The only condition under which the processes of reading would not change is if an improved alternative was invented.

Reading is a communication tool that appears to be increasing, not decreasing, in use because it is increasingly required to survive and thrive in an increasing number of human contexts (e.g., personal, occupational and financial). The capacity to read increasingly complex

text with increasing speed and fluency also appears to be continually increasing (Johnson, 2008b). Adults in literate societies are expected to quickly and effortlessly derive complex meaning from huge numbers of printed symbols (e.g., 500,000 letters of the alphabet in a single novel). According to the Organization for Economic Co-operation and Development (2013), between 4.9% and 27.7% of adults in literate countries demonstrate extremely limited reading abilities and these individuals are typically at extreme social and cultural disadvantage (Dinicola, 2007). Fortunately, there is mounting evidence that mobile phone technology supports the development of literacy among disadvantaged groups (Johnson, 2013a). According to Johnson and Oliver (2013), "in rural and remote Indigenous communities, mobile technology is actually encouraging writing among those previously disenfranchised by traditional forms of literacy" (p. 1275).

Since the invention of reading in ancient times, two evolutionary patterns are apparent: 1) the conventions and mechanisms of reading have changed to improve physical and cognitive access to text and 2) such changes have corresponded with increased social demand for and personal motivation to read. Indeed, in ancient Greece there were no scribal class. "Men of some means and better breeding placed their sons under a paidagogos to see they learned the abcedarium and the secrets of decoding poetic texts kept on papyrus and folding wax tablets" (Powell, 2009, p. 251). As with the emergence and evolution of printing press in the 15th century (Hellinga, 2009), the digital revolution has functioned as a catalyst for change to the conventions of text and the mechanisms of text distribution (Johnson, 2012b). The digital revolution has contributed to increased reading with use of new information and communication tools (Goldman & Scardamalia, 2013) and is contributing to the evolution of reading (Johnson, 2013c).

Reading in the Digital Age

Volume 16, Number 1: May 2015
ISSN: 1535-0975

The *digital age* (also referred to as the *digital revolution* and *information age*) describes the era of digital technology devices (Baron, 2009) and the associated decreased use of analogue technology devices. Analogue and digital technologies capture human sensory experiences using different mechanisms. Essentially, analogue technologies capture actual atmospheric waves with a range of devices. For example, invented by Thomas Edison in 1877, the phonograph was the first mechanical device to capture analogue sound waves (Katz, 2012). Analogue technology evolved and, until very recently, was used in a range of communication and cultural tools such as radio, television and telephone. Digital technology constituted a major breakthrough because the analogue wave was converted to a number (i.e., digit) which could be transmitted and stored much more efficiently than an analogue wave (Wheen, 2011). Digital technology rapidly transformed all communication and information transmission devices such as mobile phones and video and audio recordings. Perhaps most importantly, digital technology led directly to the development and popularization of personal computers and the internet (Johnson, 2013b).

The popularization of digital technology devices, particularly personal computers and mobile phones, gave rise to changes in written language conventions primarily due to the limitations of communicating with written text in real-time (Kent & Johnson, 2012). For the first time in history and rather abruptly, personal digital devices (e.g., computers and mobile phones) provided individuals with the capacity to receive typed messages less than one second after they were sent (Johnson, 2012b). Text messaging (also referred to as short messaging services or SMS, instant messaging and computer mediated communication) created a communication scenario in which a reader waits to receive a message while the sender types, historically using a small awkward keypad. Indeed, at the beginning of the current century, mobile phone technology was restricted to the alphanumeric keypad where one button was pressed up to four times to

Volume 16, Number 1: May 2015
ISSN: 1535-0975

select a specific character, for example, the number seven key was pressed four times to input the letter *s* (Taylor & Vincent, 2005). Despite such limitations, text-based real-time digital devices facilitated human communication and quickly became enormously popular for that very reason (Skierkowski & Wood, 2012). Humans want and need to communicate with others quickly, easily and personally. Kinzer (2010) argued "that literacy is being redefined as a result of the use of digital media" (p. 51).

The practice of text messaging in the context of keypad limitations and a waiting reader birthed a written language form referred to as *textese* (Johnson, 2012a). With unique "grammatical, lexical, stylistic and visual features" (Taylor, 2009, p. 33), textese includes "abbreviations, acronyms, emoticons, misspellings and omission of vowels, subject pronouns and punctuation" (Ling & Baron, 2007, p. 292). Turner (2010) described this language form as *digitalk* whereby language is re-formed for the purpose of communicating a message that reflects the "voice of the speaker" (p. 43). Several studies (Crystal 2008, Kemp, 2011; Kemp & Bushnell, 2011; Plester, Wood & Joshi, 2009) concur with this notion, describing textese as a linguistic creativity or playfulness where users draw on their existing language knowledge to produce written texts that are variants on Standard English forms (Powell & Dixon, 2011). Textese or digitalk, to illustrate, includes initials for common phrases (e.g., lol for laughing out loud), homophones (e.g., gr8 for great), abbreviations (cuz for because), symbols for emotions, and the omission of words, vowels, punctuation, and capitalization (Drouin, 2011). Thurlow and Poff (2013) provide a detailed and comprehension classification of text messaging conventions.

Toner (2011) highlights the fact that "punctuation rules, rather than being historically absolute, evolve and change over time" (p. 10). Furthermore, conventions are influenced by changes in technology - "shifts in media impact upon punctuation and how punctuation is

responsive to, and articulates those very changes" (p. 17). This is demonstrated in the considerable creativity of punctuation and capitalization usage in text messages (Turner, 2010). Baron and Ling (2011) examined punctuation choices in text messages made by American college students and found purposeful and ordered usage. They found numerous occurrences where traditional punctuation had been repurposed (p. 61) to suit the needs of the text message creator and recipient, for instance, where ellipses and smileys were used instead of periods. Reportedly, capitalization is commonly omitted in text messages (Ling & Baron, 2007; Taylor, 2009). This aligns with Watt's (2010, p. 143) idea that existing language and literacy skills are being adapted as users craft text messages.

Anecdotes from teachers, widely reported in the media, describe textisms "as having an adverse effect on children's written language production" (Powell & Dixon, 2011, p. 58). Turner (2010), however, argued that the abbreviated language conventions used in digital communication are not deficient but, rather, "just a different language used in special contexts" (p. 41). Wood, Jackson, Hart, Plester, and Wilde (2011) studied 9- and 10-year-olds who had not previously owned a mobile phone. Children were randomly assigned to a control condition (i.e., not given a mobile phone) or a treatment condition (i.e., given a mobile phone only enabled for text messaging). Their results demonstrated that "text messaging does not adversely affect the development of literacy skills within this age group, and that the children's use of textisms when text messaging is positively related to improvement in literacy skills, especially spelling" (p. 28). Durkin , Conti-Ramsdent, and Walker (2011) found positive relationships between textism density, number of types of textism , and measures of adolescent literacy. Kemp and Bushnell (2011) reported that better literacy skills were associated with greater textese reading speed and accuracy among l0- to 12-year-old children and concluded that there was

Volume 16, Number 1: May 2015
ISSN: 1535-0975

"growing evidence for a positive relationship between texting proficiency and traditional literacy skills" (p. 18). Neurologically, language centres in the brain are stimulated regardless of communication format or device (Johnson, 2012c). Johnson (2012a) reduced confounds by asking children to respond to traditional reading test items and define common textisms in equivalent formats under identical conditions. Ninety-one children in grades 3 through 6 translated five common abbreviations used in text messaging and, under identical conditions, completed two measures of Standard English literacy. Without exception, children who correctly defined textisms demonstrated superior skills in reading fluency and sentence comprehension (i.e., reading speed and response indicating comprehension) than children unable to define the common texting terms. “Such results add to the growing number of studies that conclude a positive association, if not effect, between digitalk and traditional literacy across the life span” (p. 1).

Statistics on global mobile phone usage report that 7.8 trillion text messages were sent in 2011 (Portio Research, 2012). It is forecasted that text-messaging traffic will continue to grow, reaching 9.4 trillion messages by 2016 (Informa Telecoms and Media, 2012). Analysis of American and Australian youth mobile phone usage found that ownership had increased for 15-18 year olds, from 56% in 2004 to 85% in 2009 (Australian Communications and Media Authority, 2010). The study also compared talk to text ratios in mobile phone usage and found that American 15-18 year olds used their mobile phones to text 72% of the time and Australian youth spent 71% of total mobile phone usage on texting. Generally, voice communication levels appear to be dropping. For example, consumers in the UK reportedly favor text messaging and other internet-based communication forms available on smartphones over voice calls (Ofcom, 2012).

Volume 16, Number 1: May 2015
ISSN: 1535-0975

The Evolution or Extinction of Reading?

Everything, including human inventions and all living species, ultimately becomes extinct. The increasing popularity of video transmission of information is apparent, for example, YouTube home repair instructions, online cooking demonstrations and exercise videos on medical websites. Voice and video transmissions are increasingly faster, possible on progressively smaller and more personalised devices and with increasingly sophisticated archiving and sharing functionality. Nonetheless, it seems likely that audio and video will continue to complement rather than replace reading. It is difficult to envision a shopping list of images as more efficient that a written shopping list (e.g., amount), although some furniture assembly instructions rely entirely on simple images (e.g., IKEA). The benefit of image over text is that it may be more universally understood that a specific written language such as English.

Digitalization, as it continues to evolve, has increased the speed with which people communicate and access information. The good old days of savouring real experiences are long gone, in part because reading created a synthetic experience (e.g., novels and travel books). While speed as a criterion of human progress is easily critiqued, the fact remains that contemporary culture strives toward progressive faster processes, for example and to mention but a few, transportation, medical procedures and information retrieval. With regard to this, it might reasonably be expected that the nature of written text would evolve to facilitate speed and ease of reading (as was the case with introduction of the convention of space between words; Houston, 2013). Such evolution is upon us with the meaningful use of icons in websites (e.g., @ indicating mail). Indeed, many written languages do not rely entirely on a sound-symbol correspondence (e.g., Chinese characters). Increased communication reliance on images and icons may signify

Volume 16, Number 1: May 2015
ISSN: 1535-0975

the evolving nature of the invention of reading and the production of text, particularly in the context of international communication.

As the human species continues to evolve, human communication continues to evolve. Human communication involves all forms of interpreting symbolic information (e.g., 'reading' the audience). Human communication includes visual cues, smells, auditory input and touch. Human communication is facilitated by human tools and technologies and, most recently, by digital technology. While all forms of reading should be celebrated for the marvellous human invention that increases access to accumulated information and facilitates communication with others, perhaps the greatest celebration might be for devices that require and thereby promote reading. With regard to this, the evolution of text (e.g., written formats and materials) is the very evidence of the continued utility and joy of the human invention of decoding text (i.e., reading :-). Reading, in the most general sense, and all those involved in facilitating, understanding and using the processes of reading, might maintain open-mindedness by situating reading in an historical and evolutionary context. Literacy is and has always been intertwined with technology.

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