



ARTICLE



<https://doi.org/10.1057/s41599-023-01646-6>

OPEN

# What drives the learning benefits of moving text? A theoretical discussion for learning implications of kinetic typography

Hye-Jung Lee<sup>1</sup> & Soyoung Park<sup>2</sup>✉

*Moving text or kinetic typography* can be effectively utilized in instructional message design because moving text in a presentation not only attracts the learner's attention rapidly but also delivers content effectively, thereby promoting learning. For optimal pedagogical application of such technology, it is necessary to investigate which properties and potentials of kinetic typography lead to learning benefits. This paper theoretically explores the learning advantages and instructional implications of kinetic typography based on the properties of oral language and written text (conceptualized as 'orality' and 'literacy', respectively) because moving text has properties that derive from both literacy and orality. The discussion implies that a critical learning benefit of moving text is not from the movement itself but from 'a shared thinking process' between instructor and learner through sequential presentation of text along with the logical flow within the learning content, which is similar to oral language.

<sup>1</sup>Institute for Education and Innovation, Seoul, Korea. <sup>2</sup>Education Research Institute of Seoul National University, Seoul, Korea. ✉email: [mellowmarie@snu.ac.kr](mailto:mellowmarie@snu.ac.kr)

## Introduction

With the development of digital technology and presentation software programs that make it easy to create and share moving text, slideware (i.e., presentation tools such as Microsoft PowerPoint and Apple Keynote) incorporating kinetic typography is increasingly used in presentations and in classroom settings (Venema & Lodge, 2013). Kinetic typography refers to technology that incorporates moving text, which is deemed to effectively deliver messages by engaging an audience's attention (Forlizzi et al., 2003; Potter, 1984). Thus, compared to static typography, kinetic typography has been found to have significant potential for learning (Jin, 2009; Lee, 2010). Nonetheless, inappropriate and excessive use of kinetic typography can impede learning by causing fatigue and cognitive overload through too much visual stimulus (Heines, 1984; Kidwai et al., 2004; Lee, 2010). Therefore, to increase its learning-related benefits, kinetic text must be designed carefully in consideration of its pedagogic potential (Jin, 2009). Despite the extensive use of kinetic typography, it is difficult to find a theoretical discussion on the advantages and pedagogical implications of kinetic typography. Because of this lack of research, kinetic typography is often produced and used arbitrarily and instinctively without any valid principles or guidelines.

Kinetic typography's contribution to learning may be considered in terms of the properties of oral language and written text, which are the fundamental media in teaching and learning. Historically, instruction has been mediated by oral language for communication and comprehension and by written language for recording and representation. Both oral and written languages have heavily influenced human thinking and behavior and have developed their own distinctive cultures. As it is primarily a form of text, kinetic typography has the properties of written language, but it differs from static typography. Moreover, although it is not purely oral language, kinetic typography can be presented sequentially like oral language and thereby has certain properties that allow a sender and a receiver to share the process of communication simultaneously. Meanwhile, oral language and written language are accompanied by a variety of non-verbal elements that serve the primary purposes of both oral and written language. These additional elements, which attract learners' attention and engagement, can trigger cognitive activities for better understanding. Kinetic typography technology also incorporates these roles of non-verbal elements.

In this context, this paper intends to theoretically examine and discuss the learning implications of kinetic typography beyond attracting learners' attention through moving text. To explore what generates learning benefits, we examine the properties of oral language and written language, which are conceptualized as orality and literacy, respectively (Ong, 1982; Lee, 2015), and both of which are fundamental to learning and instruction.

## Kinetic typography

**The concept and types of kinetic typography.** The term 'kinetic' originates from the Greek word '*kineticos*', which means moving or dynamic (Kim, 2007). It is also defined as relating to the motion of material bodies or the forces or energy associated with such motion (Jun, 2000). The word 'type' in typography refers to each individual letter. The term 'typography' means a technique or system of managing types, or types that are arranged for effective delivery of information (Im & Lee, 2003). In other words, typography, which includes types and type management techniques, is a term meaning both text design and state of types, such as typeface, font size, sentence length, spacing, alignment, margin, font color, foreground and background colors, text location, and layout (Bernard et al., 2003; Jin, 2009; Shin, 2003).

Until the nineteenth century, texts were based on consistent horizontal and vertical forms of typography. However, as different visual modifications have been attempted on text since the twentieth century, typography that seems to be moving but does not actually move has been introduced. As part of these attempts, different shapes and sizes of fonts and non-linear arrangement of letters were used to generate dynamic sensations. In this manner, a writer can more fully deliver and express the intended meaning of text as well as his or her emotion and tone. For example, the French poet Guillaume Apollinaire expressed his intentions more comprehensively by arranging texts dynamically; in his poem about rain, the texts are arranged in the shape of rainfall, and in another poem about a water fountain, the texts resemble the water spurting from a fountain (Jin, 2009). In addition to showing motion with texts, writers have also attempted to present letters or words chronologically, such as in Rapid Serial Visual Presentation (RSVP), which is a method of displaying text serially in a fixed position on a monitor instead of presenting it all at once (Potter, 1984). As the presented text does not require the reader to engage in eye-movement, RSVP has seemed to hold promise for reading.

As digital technology advanced following the 1980s, kinetic typography with actual motion began to be developed in earnest. With advances in movies, television, and computer software, it became possible to apply various expressive design strategies in presenting texts. After the appearance of kinetic typography, presentations, advertisements, and videos began to incorporate texts that moved, changed sizes and shapes, and appeared with time differential. Thus, kinetic typography is sometimes called 'moving typography', 'dynamic typography', 'temporal typography', or 'liquid typography', depending on its emphasis on movement, communication, or structure (Ishizaki, 1996; Jun, 2000; Mueller, 1998).

**Studies on kinetic typography and learning.** Studies on kinetic typography and learning have reported that kinetic typography can promote expressiveness and readability of text, and focusing and maintaining learner's attention, thus enhancing text comprehension (Jin, 2013; Lim, 2018; Marchetti and Cullen, 2016). Regarding the expressiveness aspect of text, kinetic typography can be an effective tool, as it evokes human emotion by combining form with narrative text. Research shows that kinetic typography can show emotion and feeling effectively by transforming shapes, sizes, colors, and lengths of letters, words, sentences, or paragraphs (Chung, 2008). Ston, Alenquer, and Borisch (2003) explains experimentally that kinetic typography has more influence on people's emotions than static typography as it can deliver affective aspects more effectively. Ford et al. (1997) also demonstrates that kinetic typography improves text comprehension by effectively displaying the sender's tone, the characteristics of objects, and the atmosphere.

Studies focusing on the effectiveness of kinetic typography discuss its influence on text readability (Forlizzi et al., 2003; Potter, 1984). On the one hand, there has been numerous research on Rapid serial visual presentation (RSVP), which is a method of bypassing eye-movement by presenting a group of word in the same location serially is known to have significant potential to support reading (Potter, 2018). Such method has been reported to increase the reading rates and text readability in electronic text by allowing trading space for time (deBruijn & Spence, 2000). Some studies suggest that RSVP promises to be a different way to read text that might reduce the cognitive load of reading (Rahman & Muter, 1999) by reducing information processing time, speeding information searches and recognition

that can promote information transfer for automatic processing (Matin & Boff, 1988; Matin et al., 1993). Other studies focus on the effects of arranging text to make the auditory aspect of language visible using the visual transformation of text. Lim (2018) reported that kinetic typography, which has been transformed in shapes, sizes, and colors worked as a learning aid for learning English intonation and word stress, thus enhancing text comprehension. Besides, learners can more clearly grasp the relationship of difficult text as well by means of experiencing kinetic typography. Lau and Chu (2015) analyzed how motion graphics support learners' text comprehension. They report that kinetic typography such as animated typeface and movement, which provides more functional and profound impression of words can stimulate and strengthen learners vocabulary comprehension by increasing their level of sensitivity and learnability.

Not only that, kinetic typography can also support efficient learning by adaptively drawing learners' attention and responding to learners' needs, thereby improving convenience in learning (Jin, 2013). This is because text can be selectively emphasized through the change of shapes, sizes, colors, movements, etc. Ishizaki (1996) suggests that the multi-agents designed by the computer system emphasize the updated content as the intention and needs of users in the situational context. In his multi-agent system, when new content is updated, the title letters on the screen become visually more emphasized by moving or increasing in size. Furthermore, when a user places the cursor over a particular information, relevant content titles become clearer and bigger, while other content fades out. Such display of text can help users to explore necessary content more conveniently. It may be possible to use kinetic typography in a web-based learning interface that adaptively reacts to learner's changing intentions and interests (Lee and Park, 2012).

However, studies also report that kinetic typography may have negative effects on text comprehension if improperly used (Jin, 2013). First, although kinetic typography can effectively deliver emotions expressed textually, it may be difficult to express delicate or ironic emotions (Forlizzi et al., 2003). Furthermore, studies show that the chronological presentation of text also results in different influences depending on situation and strategy (Mills & Weldon, 1987). Although RSVP is known to encourage faster and more comprehensible reading than simultaneous presentation, deBruijn and Spence (2000) assert that research on the effects of RSVP does not show that RSVP is always more effective than normal page format because the effects of RSVP depend on various factors, such as the amount of information presented at one time, duration, pause, and speed. Additionally, studies have indicated that too much stimulus used in digital text can tire learners' eyes cause cognitive overload and negatively influence readability, and learning performance (Heines, 1984; Kidwai et al., 2004; Lee, 2010; Park et al., 2015). Too many visual elements of presented information may overwhelm working memory and decrease the effectiveness of instruction, according to cognitive load theory, which primarily emphasizes working memory capacity limitations as a factor in instructional design (Kalyuga, 2000). For example, if learners are provided with complex pictorial information with text, such overload of visual information may deteriorate learners' higher level of performance whereas pictorial information accompanied by narration can rather enhance learning performance (Park et al., 2015). Therefore, to enhance the learning benefits of kinetic typography, it is necessary to thoroughly consider the type of text, the semantics and content of text, the level of web technology available, and appropriate design principles (Jin, 2009).

Although numerous studies have demonstrated the advantages and/or disadvantages of kinetic typography, there is nonetheless a

lack of conceptual and theoretical discussion that addresses why and how kinetic typography may be effective or ineffective in learning. Therefore, more research is required to examine how text presentation by kinetic typography can assist with learning.

### Orality and literacy

Oral language and written language are essential tools in teaching and learning. Initially, written language most likely took forms that resembled the recording of oral language, just as early motion pictures were simply recordings of stage plays. As written language evolved, it acquired a distinct nature and further developed its own culture as it influenced human thinking in a manner that differed from oral language. Walter Ong conceptualized these characteristics of oral and written language in his book (1982); *Orality* involves the nature and properties of oral language that influence human thinking and behavior, while since the time that letters were first distributed, *Literacy* involves the nature and properties of written language, which influence human thinking and behavior differently from *orality*.

**Why the orality-literacy framework?** Ong's orality-literacy framework is used as a tool to investigate the learning benefits of kinetic typography for the following reasons. First, although kinetic typography—as a mode of representation—has certain properties that can be treated as 'image', it remains fundamentally 'text'. Thus, kinetic typography follows the 'logic of writing' more closely than the 'logic of image' for literate people. Kinetic typography is clearly distinguished from typical 'image' by two critical potentials: 'semantic' potential and 'temporal' potential. As Kress (2003) argued that the logic of space (or visual grammar) is applied in 'image', the logic of space might also be applied somewhat in writing on the screen, at least more than in writing on the page of a book. However, the logic of space applied in writing on the screen is only limited to fonts, location, or layout, which are not critically related to the content itself. In other words, text screens at first glance may appear to follow the logic of space, but once a reader starts to read, the content is received as a semantic message, not as an image, and therefore follows the linear logic of writing. Text is semantically received, not as a visual image, by the literate. Therefore, this paper chooses a language framework rather than another framework that emphasizes the visual aspect of representation.

Second, Ong's concept of 'literacy' is academically different from other concepts of writing. The concept of 'literacy' is understood extensively to describe the 'ability to read and write' and 'culture, properties or nature of writing, and even intelligence which influence the ability to read and write'. Kress (2003) also argued that the concept of 'literacy' should be expanded to include social, cultural, and environmental comprehension of various messages communicated by multimode media; however, he presented 'oracy' or 'numeracy' as corresponding antonyms of 'literacy' (Kress, 2003; pp. 23–25), which is quite different from Ong's 'literacy' as an antonym of 'orality' (Ong, 1982). Ong's 'literacy' focuses more on the nature and properties of written language that may influence culture and the modes of thinking by reading and writing, while Kress's 'literacy' is the concept within the frame of reading and writing ability that is generally understood as an antonym of oracy. Lee (2015) integrated Ong's concept of orality and literacy and articulated the framework from theoretical and experimental studies. This paper takes the conceptual framework of Ong (1982) and Lee (2015) instead of Kress's or any other framework because Ong's and Lee's concepts of orality-literacy provide a useful perspective to figure out the significant learning implications of kinetic typography.

**Orality for communication and comprehension.** The primary purpose of oral language is to deliver a speaker’s message to an audience and to facilitate comprehension and communication (Lee, 2015). Hence, a variety of expressions evolved in oral language to maximize the audience’s understanding, building the properties of orality as a consequence.

Following this developmental background, the unique properties of oral language, so-called orality, were established. Oral language is empathic, simultaneous, additive, transformational, and specific (Ong, 1982). Based on these characteristics, from the perspective of education, oral language pursues effective communication and comprehension rather than recording and organization (Lee, 2015). While speaking, it is common to use expressions such as ‘in other words, what I’m saying is, in a nutshell, for example, I mean, etc.’ to rephrase the intended message for better understanding. However, repetitive rephrasing in writing is criticized as ‘wordy’. Not only that, oral languages are encoded with more tacit information such as tone or speed of voice, intonation, and even the speaker’s para-verbals signals such as silence, throat-clearing sound, and so on.

Another property of oral language is that the speaker and audience communicate simultaneously. As simultaneous communication is inherent in oral language, a speaker and an audience can easily share and emphasize each other’s emotions, a process in which various non-verbal components are also used. Therefore, oral language involves different non-verbal components, such as tones, facial expressions, and gestures. With these non-verbal components conveying different messages, orally delivered messages are different from text messages even if the verbalized content is written exactly the same.

**Literacy for record and representation.** In contrast to oral language, the primary purposes of written language are recording and representation (Lee, 2015). During its initial development, written language seemed to be used to record what was said as exactly as possible. To express and understand written language, different auxiliary tools such as punctuation marks, word spacing, grammar, or spelling have been developed. Despite these efforts, oral language had stronger effect than written language initially. Thus, the impact of written language in the early age of text was perfected officially only when the information was also presented as oral language (Ong, 1982). Nevertheless, in today’s society—where literacy has established its own independent culture—written language gradually has been adopted for general use with its own particular properties. It now has its own style of communicating information and influencing people’s thinking process. In today’s society, documents that are written down, rather than articulated orally, tend to have more official and legal authority.

In written language, a writer and a reader communicate asynchronously. Such inherent characteristics bring different properties to literacy. Generally, a writer and a reader are emotionally independent and rational rather than empathetic and emotional. Whereas oral language is additive and grammatically inconsistent (variational and transformational), written language seeks conciseness and grammatical consistency. It is very difficult to designate additive, situational, or contextual information of writer owing to the limitation of the words on a page. Additionally, based on the input and output technology of text, writer’s attitude, content, and text structure have changed dramatically (Lee, 2015). For example, the early appearance of writing technology in Asia took the form of a brush dipped in Chinese ink and traditional cloth or paper. The difficulty or impossibility of correcting or editing writing at that time led people to take writing as a serious undertaking. In the East,

Table 1 Characteristics of orality and literacy.		
Classifications	Orality	Literacy
Thinking modes	Oral	Literal/textual
Representation modes	Oral	Literal/textual
Primary purposes	Communication	Record
	Comprehension	Representation
Reception senses	aural dominant	Visual dominant
Characteristics	Synchronous	Asynchronous
	Immediate	
	Time-dependent	Space-independent
		interface space-dependent
	Redundant	Succinct
	Additive	Concise
	Empathetic	Objectively distanced
	Participatory	Rational
	Situational	Abstract
	contextual	De-contextual
	flexible	Fixed

people used to sit properly with sincere and earnest attitude in a calm environment when writing calligraphy. The next form of print technology brought forth a historical revolution, enabling the reproduction of print editions and copies. Then, typewriters were invented, and typing replaced writing. However, in its earliest forms, the typewriter also did not allow free editing and deleting. Computer and Internet technology allow for the physical activity of typing with the freedom of synchronous or near-synchronous editing. All these changes have epoch-making influences on our way of thinking, communication, attitudes, and perceptions (Lee, 2015).

Moreover, oral language is *time-dependent* communication because it delivers information sequentially and chronologically and is temporary for a time as it decays as soon as it appears, whereas written language is *space-dependent* communication because it can be read simultaneously in different places and *interfaces (paper or screen)* because there should be always a paper or a screen to represent the written language. These characteristics of orality and literacy are described in Table 1, modifying the conceptual framework of Ong (1982) and Lee (2015).

**Evolution to technology-based orality and literacy.** There have been many changes and technological developments involving modes of communication, and those changes sometimes lead to changes in the fundamental nature of oral and written language. For example, Ong (1982) noted that the nature and properties of oral language in recorded broadcasting are qualitatively transformed from those of traditional orality in terms of language rules and usage; therefore, he conceptualized this new trait as *secondary orality*. In addition, Lee (2015) found that e-texting of mobile or SMS (Short message service) communication, which has recently become dominant as another mode of communication, is essentially different from traditional text literacy in its language transformation and new grammar; therefore, she conceptualized this different trait as *secondary literacy*.

Kinetic typography seems to be related to neither secondary orality nor secondary literacy because the kinetic property does not transform the fundamental properties of traditional language rules and phraseology. Instead, kinetic potential leads to changes in the mode of representation, not the essential language rules of grammar, usage, words, or phraseology. Therefore, it is more appropriate to discuss the learning implications of kinetic typography within the original orality vs literacy framework than within the technology-driven secondary orality vs secondary



literacy framework, although technologies generate current kinetic typography.

### Learning implication of kinetic typography from the perspective of orality and literacy

Considering that kinetic typography is moving *text*, it has properties of written language. However, kinetic typography features not only the properties of written language but also those of oral language for two main reasons. First, although kinetic typography presents what a writer has written, it can represent the content in a manner that emphasizes certain parts and delivers the author's emotion and intention effectively as if the words were spoken by the writer, thereby promoting communication (Uekita, Sakamoto, & Furukata, 2000). Kinetic typography can represent the text in a variety of ways; it can change the location, size, shape, and font of letters and control the amount and speed of displayed texts. These diverse expressions differ from typical static texts; thus, kinetic typography, like oral language, can use non-verbal effects to express the emotion and intention of a writer more fully. It can emphasize, revise, and repeat explanations, and it reflects the writer's tone of voice. In a similar context, Chung (2008) also stated that kinetic typography features orality as it can visually represent oral language by transforming text and integrating motion.

A second reason for the orality of kinetic typography is that it displays information as if the writer and readers were communicating synchronously. In static typography, the knowledge, concept, idea, or information a writer intends to communicate is presented asynchronously as a type of 'product' that is visualized by text all at once. However, in kinetic typography, letters can be presented sequentially in chronological order. Such sequential presentation of text allows readers to understand not only the message itself but also the logical 'process' of the message.

The critical learning benefit of kinetic typography is that learners can share the cognitive process of an instructor or the logical flow of the learning context. Static text written in a book or in a static presentation material provides the 'product' of cognitive achievement by scholars who discovered or invented concepts and theories. For example, when a diagram of four circles for different categories is used to explain a concept, it cannot be known which of the four categories was drawn first. However, kinetic typography allows the circles to be presented sequentially, thus helping the learners understand the concept flow and to comprehend the logical process of which circle to begin from. When an instructor explains by writing down the content sequentially on the chalkboard and sometimes highlighting or circling important parts, it is easier for learners to understand because they are able to follow the instructor's logical cognitive process. Without listening to the instructor's explanation, it would be more difficult to grasp the cognitive process just by looking at the chalkboard full of notes all at once. Students would not know where to begin trying to understand the content.

Sharing the sequential cognitive process means facilitating the logical comprehension of the learning context. Logical comprehension requires sequential, serial, and linear understanding. The dialectical logic that 'A is B and B is C, and therefore A is C' requires understanding first that A is B, and then that B is C and finally that A is C. In this sequential process, the prior understanding provides the basis for comprehending the content that follows. Understanding logically is different from understanding intuitively. Intuitive understanding does not occur sequentially but takes place instantly. The process of intuitive understanding cannot be explained logically or sequentially. For instance, when selecting a restaurant for a social gathering, one intuitively knows at first glance if the atmosphere of the place is suitable. It may be

hard to describe logically what exactly led to choosing (or rejecting) the restaurant.

In many cases, cognitive learning in educational institutions requires logical comprehension more than intuition. An explanation delivered through sequential oral language is mostly logical. Therefore, sharing the process of logic behind the given explanation significantly influences learning. To share the logical process, an oral lecture may be better than just a textbook in many cases, as the former offers a way to share the cognitive process. The text may be useful in delivering one-dimensional sequential logic, but it is not sufficient to explain multi-dimensional logic, thus needing an oral lecture. In a strict sense, the textbook and the lecture do not present the same information. The former delivers the cognitive product and the latter delivers the cognitive process. For this reason, an author's oral lecture can still receive a fervent response even when the author's book is well written. Even for bestselling books, audiences still want to hear the author's oral lecture because it is not the same as reading the book.

Kinetic typography expands the capacity of text to enable sharing even the process of cognition between a sender and a receiver. Therefore, the greatest learning benefit of kinetic typography can be found not only in gaining attention but also in facilitating logical cognition by allowing the instructor and learners to share the cognitive process. If the logical flow or sequence of the content is not considered carefully enough to share the cognitive process, kinetic typography may have negative effects on information presentation, leading to cognitive overload and disorientation from split-attention<sup>1</sup> or distraction.

In summary, orality seeks *communication* and *comprehension*, while literacy seeks *recording* and *representation*. The prefix *com~* connotes *together*. In other words, the orality of kinetic typography implies that the speaker and the audience share the time of the presentation and thus share the cognitive process together. Therefore, only when sharing the knowledge generation process is the learning objective—in other words, when an audience should or must participate in the logical flow and thinking process—kinetic typography should be applied to represent the text with consideration of kinetic typography's orality. Otherwise, random excessive use of kinetic typography (such as a ceaseless blinking on a learning website) hinders concentration on learning by drawing the audience's attention to the movement itself. Meanwhile, the prefix *re~* connotes *again* or *back*. Thus, *recording* and *representation* of literacy imply that the message is inscribed and presented to recall later. So it might be suggested to use static text as literacy for recording and representation (e.g., when presenting static text in table or bullet form all at once, not sequentially), rather than as orality with a sequential, redundant, and additive style, such as when learners need to grasp the overview or overall structure of a message.

### Conclusion

This paper discusses the learning implications of kinetic typography using the orality-literacy framework to enhance the theoretical understanding of the properties and learning benefits of kinetic typography and the design implications of digital learning materials.

This paper suggests that kinetic typography should be used more attentively and meticulously, as the pedagogical implications of kinetic typography are found in orality and literacy, not in the movement itself. The nature of capturing attention is not a matter of motion but of distinction. When most of the text is static, kinetic text attracts attention quite powerfully, but when most of the text is kinetic, static text attracts more attention. Thus, careless overuse of kinetic typography may only cause distraction in learning. Therefore,

the design of learning contents using kinetic typography should focus on how to make critical content distinctive. In addition, how to present logical flow and depict overall structure should be further explored in interface design.

In digital learning, how to design specific information or knowledge in a way that reduces cognitive load and enhances interactivity between learner and content is critical (Stull & Mayer, 2007). Various visual representations are encouraged to help learners focus on more relevant information and to engage in learning more effectively (Mayer & Moreno, 2003; Quintana et al., 2004; Yoon, 2011). Kinetic typography can function as a representational tool that catalyzes, bridges, and scaffolds learners' understanding. Specifically, providing static visual representation in digital learning materials renders learners' reading multi-linear because chunks of information are likely to be scattered non-sequentially (Bolter, 1998), which can easily lead to cognitive overload and disorientation (Hellen, 1990). Therefore, the specific properties of kinetic typography, such as timely sequential presentation and movement, must be carefully considered with the serial logical flow of learning context to facilitate learners' understanding in digital learning material design. On top of that, it is also highly important that kinetic typography should be designed considering learner controllability as well. Learners need to be able to have control and adjust the interface in ways that can promote their individual learning at most.

Based on the theoretical understanding of the fundamental properties of kinetic typography provided in this article, future research is suggested to investigate prescriptive strategies for optimum use of kinetic typography with experimental studies. Additionally, if another theoretical discussion were to be added, such as kinetic typography as a perspective of 'image', kinetic typography might be more deeply understood for better pedagogical use in digital content design.

## Data availability

Data sharing is not applicable to this research as no data were generated or analyzed.

Received: 29 August 2022; Accepted: 27 March 2023;

Published online: 15 April 2023

## Note

- Chandler and Sweller (1992) suggested arranging similar contexts of information adjacently when displaying text and image together to reduce split-attention. This implies that aligning text sequentially with the logic flow would significantly reduce split-attention.

## References

- Bernard M, Chaparro B, Mills M, Halcomb C (2003) Comparing the effects of text size and format on the readability of computer-displayed Times New roman and Arial text. *Int J Hum Comput Stud* 59(6):823–835
- Bolter J (1998) Hypertext and the question of visual literacy. In: Reinking D, McKenna M, Labbo L, Keiffer R (eds.) *Handbook of literacy and technology: transformations in a post-typographic world*. Mahwah, NJ: Erlbaum. pp. 3–13
- Chandler P, Sweller J (1992) The split-attention effect as a factor in the design of instruction. *Br J Educ Psychol* 62(2):233–246
- Chung H (2008) A study on intrinsic qualities of moving typography as the 4th language. *J Basic Design Art* 9(2):807–817
- deBruijn O, Spence R (2000) Rapid serial visual presentations: a space-time trade-off in information presentation. *Proceedings of the Working Conference on Advanced Visual Interfaces*. Palermo, Italy: ACM Press. pp. 189–192
- Ford S, Forlizzi J, Ishizaki S (1997) Kinetic typography: Issues in time-based presentation of text. *CHI'97 Conference Extended Abstracts*, pp. 269–270
- Forlizzi J, Lee J, Hudson S (2003) The kinedit system: Affective messages using dynamic text. *Proceedings of CHI 2003*. ACM Press, Fort Lauderdale, FL. pp. 377–384
- Heines J (1984) *Screen design strategies for computer-assisted instruction*. Digital Equipment Corporation, Bedford, MA
- Hellen R (1990) The role of hypermedia in education: a look at the research issues. *J Res Comput Educ* 22(4):431–441
- Im H, Lee J (2003) The research about symbolic approach of typographic in web design. *J Vis Des Stud* 13:113–123
- Ishizaki S (1996) Multi-agent model of dynamic design: Visualization as an emergent behavior of active design agents. *Proceedings of the SIGCHI conference on Human factors in computing systems: common ground*. ACM, pp. 347–354
- Jin S (2009) A study on visual transformation of digital text for enhancing text comprehension: A perspective from text structure and contents. (Unpublished doctoral dissertation). Seoul National University, Seoul, Korea
- Jin SH (2013) Visual design guidelines for improving learning from dynamic and interactive digital text. *Comput Educ* 63:248–258
- Jun S (2000) The new typography today: Issues in kinetic typography from the perspective of Jan Tschichold (unpublished master's thesis). Carnegie Mellon University, Pennsylvania
- Kalyuga S (2000) When using sound with a text or picture is not beneficial for learning. *Aust J Educ Technol* 16(2):161–172
- Kidwai K, Mynufu M, Swain WJ, Ausman BD, Lin H, Dwyer F (2004) Effect of visual scaffold and animation on students' performance on measure of higher order learning. In: Simonson M & Crawford M (eds.), *Proceedings of AECT: Association for Educational Communications and Technology Research and Theory Division*. AECT, Chicago, IL. pp. 451–459
- Kim J (2007) A study of communication on the kinetic typography. *J Commun Des Stud* 33:4–12
- Kress G (2003) *Literacy in the new media age*. Routledge, London, England
- Lau NM, Chu VH (2015) Enhancing children's language learning and cognition experience through interactive kinetic typography. *Int Educ Stud* 8(9):36–45
- Lee H (2010) The effects of digital text using kinetic typography on academic achievement and perceived learnability. Unpublished master's thesis. Seoul National University, Seoul, Korea
- Lee H-J (2015) A theoretical discussion for e-text communication in learning. *Interact Learn Environ* 23(3):317–331
- Lee H-J, Park S (2012) Learning implications of kinetic typography from the framework of orality and literacy. *Proceedings of Korean Association for educational information and media (KAEIM)*. Seoul, Korea. May 12, 2012
- Lim CH (2018) Kinetic typography visual approaches as a learning aid for English intonation and word stress. (Unpublished doctoral dissertation). University of Malaya, Kuala Lumpur, Malaysia
- Marchetti L, Cullen P (2016) A multimodal approach in the classroom for creative learning and teaching. *Psychol Creat Approach Lang Teach* 5(1):39–51
- Matin E, Boff K (1988) Information transfer rate with serial and simultaneous visual display formats. *Hum Fact* 30(2):171–180
- Matin E, Shao K, Boff K (1993) Saccadic overhead: Information-processing time with and without saccades. *Percept Psychophys* 53(4):372–380
- Mayer R, Moreno R (2003) Nine ways to reduce cognitive load in multi-media learning. *Educ Psychol* 82:715–726
- Mills C, Weldon L (1987) Reading text from computer screens. *ACM Comput Surv* 19(4):392–358
- Mueller T (1998) Liquid typography: The transformation of traditional, static typography into a dynamic form present in time-based and interactive environments. *Proceedings of IIID Vision Plus 4*. pp. 26–46
- Ong W (1982) *Orality and literacy: the technologizing of the word*. Methuen, London, England
- Park B, Flowerday T, Brünken R (2015) Cognitive and affective effects of seductive details in multimedia learning. *Comput Hum Behav* 44:267–278
- Potter MC (2018) Rapid serial visual presentation (RSVP): A method for studying language processing. In: David EK and Marcel A (eds). *New methods in reading comprehension research*. Routledge, pp. 91–118
- Potter M (1984) Rapid serial visual presentation (RSVP): a method for studying language processing. In: Kieras DE, & Just MA (eds.) *New methods in reading comprehension research*. Lawrence Erlbaum Associates, Hillsdale, NJ. pp. 91–118
- Quintana C, Reiser B, Davis E, Krajcik J, Fretz E, Duncan R, Kyza E, Edelson D, Soloway E (2004) A scaffolding design framework for software to support science inquiry. *J Learn Sci* 13(3):337–386
- Rahman T, Muter P (1999) Designing an interface to optimize reading with small display windows. *Hum Fact* 41(1):106–117
- Shin C (2003) *Digital typography*. Impress, Seoul, Korea
- Ston R, Alenquer D, Borisch J (2003) Type, motion and emotion: a visual amplification of meaning. In: McDonagh D. et al. (eds). *Design and emotion: the experience of everyday things*. CRC Press, Boca Laton, FL. pp. 190–194
- Stull A, Mayer R (2007) Learning by doing versus learning by viewing: three experimental comparisons of learner-generated versus author-provided graphic organizers. *J Educ Psychol* 99:808–820

- Uekita Y, Sakamoto J, Furukata, M (2000) The method of kinetic typography communication. Proceedings of 2000 IEEE International Conference. Nashville, TN, USA. pp. 432–436
- Venema S, Lodge J (2013) Capturing dynamic presentation: using technology to enhance the chalk and the talk. *Aust J Educ Technol* 29(1):20–31
- Yoon S (2011) Using social network graphs as visualization tools to influence peer selection decision-making strategies to access information about complex socioscientific issues. *J Learn Sci* 20(4):549–588

### Funding

This research was not funded.

### Competing interests

The authors declare no competing interests.

### Ethical approval

This article does not contain any studies with human participants performed by any of the authors.

### Informed consent

This article does not contain any studies with human participants performed by any of the authors.

### Additional information

**Correspondence** and requests for materials should be addressed to Soyoung Park.

**Reprints and permission information** is available at <http://www.nature.com/reprints>

**Publisher's note** Springer Nature remains neutral with regard to jurisdictional claims in published maps and institutional affiliations.



**Open Access** This article is licensed under a Creative Commons Attribution 4.0 International License, which permits use, sharing, adaptation, distribution and reproduction in any medium or format, as long as you give appropriate credit to the original author(s) and the source, provide a link to the Creative Commons license, and indicate if changes were made. The images or other third party material in this article are included in the article's Creative Commons license, unless indicated otherwise in a credit line to the material. If material is not included in the article's Creative Commons license and your intended use is not permitted by statutory regulation or exceeds the permitted use, you will need to obtain permission directly from the copyright holder. To view a copy of this license, visit <http://creativecommons.org/licenses/by/4.0/>.

© The Author(s) 2023