

Exploring the Effect of Word-Scale Visualizations on Reading Behavior

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► **To cite this version:**

Pascal Goffin, Wesley Willett, Anastasia Bezerianos, Petra Isenberg. Exploring the Effect of Word-Scale Visualizations on Reading Behavior. Extended Abstracts of the Conference on Human Factors in Computing Systems (CHI), 2015, New York, NY, United States. ACM, 10.1145/2702613.2732778 . hal-01127995

HAL Id: hal-01127995

<https://hal.inria.fr/hal-01127995>

Submitted on 9 Mar 2015

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Exploring the Effect of Word Scale Visualizations on Reading Behavior

We report on a study that examined how word-scale visualizations for e.g. <vis here> are used in information reading of a small sentence.

We examined information reading, retention and preference for different word-scale visualization positions. Additionally, we checked if participants retrieved information from the text or from the word-scale visualizations.

Our long-term goal is to study how the placement of word-scale visualizations in text impacts reading in a broader context. We are interested in whether or not word-scale visualizations can enhance memorability and text comprehension. Additionally, we want to investigate which cases and contexts are more suitable to which position.

«top» position

The word-scale visualization is positioned in the inter-line space just over the specific word it adds context to.

14.11.1918 report from Bezirkshauptmannschaft Dux
[Duchov] that Postkommandant Robert Jacobi was on
8.11.1918 hindered in his duties by a control of the

«right» position

The word-scale visualization is added next to the specific word—in the inter-word space.

14.11.1918 report from Bezirkshauptmannschaft Dux
[Duchov] that Postkommandant Robert Jacobi was on
8.11.1918 hindered in his duties by a control of the

interactive «overlay» position

The word-scale visualization is put over the specific word. Through hover interaction it can be revealed.

14.11.1918 report from Bezirkshauptmannschaft Dux
[Duchov] that Postkommandant Robert Jacobi was on
8.11.1918 hindered in his duties by a control of the

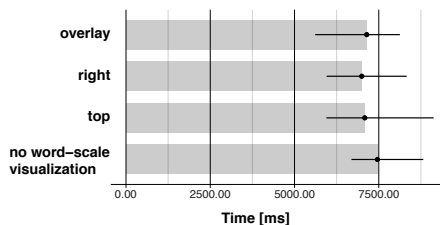
«no word-scale visualization» position

For this case there is no word-scale visualization only text.

14.11.1918 report from Bezirkshauptmannschaft Dux
[Duchov] that Postkommandant Robert Jacobi was on
8.11.1918 hindered in his duties by a control of the

H1: Reading a sentence with a word-scale visualization increases reading time.

"top" takes more time than "right" since readers can no longer continue their linear reading flow. "Overlay" needs longest as interaction is involved.

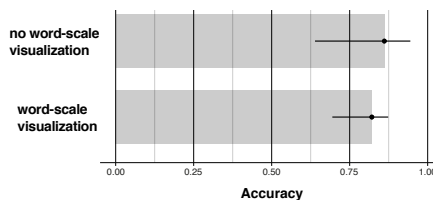


H1 not confirmed

Interesting to see that interaction had no practical detrimental effect with the "overlay" condition

H2: Questions for sentences with a word-scale visualization will be answered more correctly

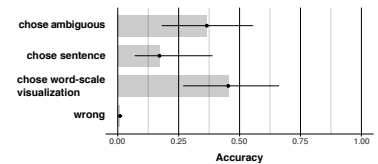
given their memorable visual nature of the word-scale visualization.



H2 not confirmed

H3: Readers will most often use information from the word-scale visualization to answer questions for ambiguous cases

given their memorable visual nature.



H3 partially confirmed

When participants did not identify the ambiguity, they tended to pull their answer most often from the word-scale visualization rather than the sentence

Questionnaire results

No position was consistently ranked number 1. Three groups of participants can be distinguished.



	P43	P30	P45	P46	P48	P47	P44	P41	P40	P49	P42
RANKING TOP	■	■	■	■	■	■	■	■	■	■	■
RANKING RIGHT	■	■	■	■	■	■	■	■	■	■	■
RANKING OVERLAY	■	■	■	■	■	■	■	■	■	■	■
RANKING WITHOUT WSV	■	■	■	■	■	■	■	■	■	■	■

«I prefer the "top" word-scale visualization over the "interactive" one because it provides the best of two worlds: allows for reading smoothly and allows for quick access to trend with one glance.»

«... right of the word was the easiest for me as I just had to follow the line to get the information ...»

«[The] interactive version gave me the choice to display [only when] I felt the need ...»

Word-scale visualization

These are small visualization that display information associated with specific words in the text, and are a generalization of the more well-known term sparkline: "a small, intense, simple, word-sized graphic with typographic resolution". Word-scale visualizations have a wider range of sizes and less strict requirements than sparklines and can encompass a wider range of "word-scales" and can use a variety of visual encodings.

[Tufte, E. R. Beautiful Evidence. Graphics Press, Cheshire, CT, 2006; Goffin, P., Willett, W., Fekete, J.-D., and Isenberg, P. Exploring the placement and design of word-scale visualizations. IEEE TVCG 20, 12 (2014), 2291-2300.]

Why this study?

Inserting word-scale visualizations between words or lines may require to reflow the text, to add inter-line space or to increase the space between words. Given that the placement of word-scale visualizations can significantly change the layout and appearance of a text, we hypothesize that readers may react differently to the text depending on what placement strategy is used.

Four different information-related conditions

- the information was encoded only in the text
- the information was encoded only in the visualization
- the information was redundantly encoded in both the text and the visualization
- information was encoded in text and visualization but contradicted each other.

The average class size of a primary school class in Drussetstein was 30 ant students, although the class size has been decreasing over the years.

Example of a sentence presented to the participants

An example sentence for an ant colony with the statistic "average class size" characterized by a number and a trend over the last 50 ant years.

Ants in Istandia-State had a suicide mortality rate per one hundred thousand ants of 6.0, with the suicide rate increasing over the years.

Example of an ambiguous sentence

An example sentence describing information ambiguously encoded in the sentence (trend = increasing) and in the word-scale visualization (decreasing).

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