

Motivation Effect of Illustrations in Text Comprehension: An Eye-Tracking Study

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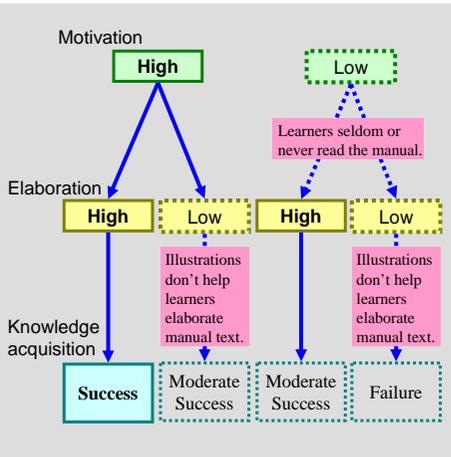
Motivation Effect of Illustrations in Text Comprehension

Elaboration Effect of Diagrams and Illustrations

- Diagrams and illustrations serve as supporting device for comprehending associated text. This is due to "elaboration effect of diagrams and illustrations," i.e., text with the support is more deeply elaborated than the one without the support.
- Larkin and Simon (1987) reported why a diagram is so rich in information content in their paper titled "Why a diagram is (sometimes) worth 10000 words."
- Though the purpose of illustrations is not exactly the same as that of diagrams, illustrations also promote elaboration (Shimada & Kitajima, 2006).

Motivation Effect

- In our previous study (Shimada & Kitajima, 2006), we found that illustrations motivate learners to read.
- Illustrations have not only elaboration effect but also motivation effect. Diagrams and illustrations do help learners comprehend the manual contents, but they are useless unless they are read. Motivation to read is one of critical conditions for knowledge acquisition.



Purpose of this Study

We proposed how to evaluate motivation effect of illustrations (Shimada & Kitajima, 2006). But, the process was not clear. In this study, we further investigate the process that causes the motivation effect of illustrations by analyzing eye-tracking data.

Experiment 1: How to Evaluate Motivation Effect

- Reported in Shimada & Kitajima (2006).

Method

Materials

- Illustrated Pages:** Revised disaster evacuation manual provided by Kawagoe city, Japan (<http://www.city.kawagoe.saitama.jp/bousai/>).
 - The manual consists of eight Web pages.
 - Each page includes two to seven headings with explanatory text.
 - Each heading corresponds to some evacuation rule and has an associated illustration.
- Unillustrated Pages:** Illustrations removed from the illustrated pages.

Participants

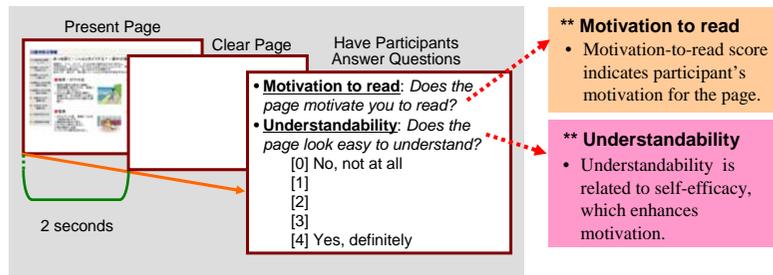
- Thirty-four adults (6 females and 28 males; age 18 to 28)

Procedure

- The participants were allowed to glance at the presented Web page for two seconds and were then asked to answer the two questions; motivation to read and understandability.



Note that Kawagoe City has permitted the use of the Web materials for publication.



Motivation to read
 • Motivation-to-read score indicates participant's motivation for the page.

Understandability
 • Understandability is related to self-efficacy, which enhances motivation.

Results

- The mean motivation-to-read score for illustrated pages were significantly higher than that for unillustrated pages ($p < .01$).
- The illustrated pages did motivate the participants more to read them within the mere two-second glancing period than the unillustrated pages did.

	Illustrated	Unillustrated
Motivation to read	3.0 (.41)	1.8 (.46)
Understandability	3.3 (.33)	1.8 (.46)

References

- Larkin, J. H., & Simon, H. A. (1987). Why a diagram is (sometimes) worth ten thousand words. *Cognitive Science*, 11, 65-99.
- Shimada, H. & Kitajima, M. (2006). Why Do Illustrations Promote Text Comprehension? Motivation Effect and Elaboration Effect. *Proceedings of 5th International Conference of the Cognitive Science*, 185-186.

Experiment 2: Eye-Tracking Study

Method

Materials

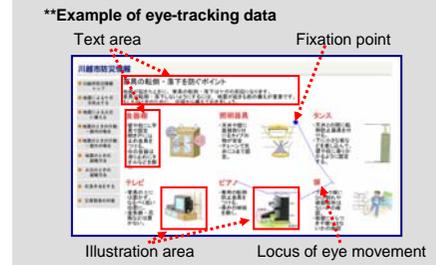
- Same as experiment 1

Participants

- 19 adults (10 females and 9 males; age 18 to 28)

Procedure

- Eye-tracking was added.
- Participants' eye-movements were recorded using a Tobii x50 eye-tracker.



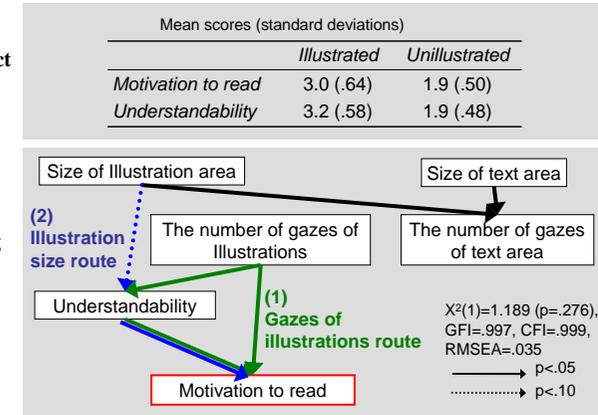
Results & Discussion

Checking the Motivation Effect

- The mean motivation-to-read score for illustrated pages were significantly higher than that for unillustrated pages ($p < .01$).
- This result is consistent with experiment 1.

Structural Equation Modeling

- We examined the relationship among the variables by structural equation modeling.
- We found two routes to enhance motivation.



Route 1) Gazes of illustrations route

- One is the effect of the number of gazes of illustrations.
- The effect is divided into the following two routes.
 - A) direct effect from gazes to motivation
 - B) indirect effect via understandability
- The result suggests that the more people gaze at illustrations, the more motivation is enhanced.
 - Gazes of illustrations also increase understandability (self-efficacy), and then enhance motivation as an indirect effect.
- The effect may be caused by participants' past experiences that illustrations promoted their understanding.

Route 2) Illustration size route

- The other is the effect of the size of the illustration area.
 - The illustration size significantly affected the motivation-to-read score due to enhanced understandability.
 - In contrast, the illustration size did not affect the number of gazes of illustrations.
- The results suggest that large illustrations enhance motivation, and the route is distinguished from that of the number of gazes on illustrations.
- The effect may be caused by improvement of the overall impression of pages, which includes large illustrations.

Conclusion

- We investigated the process that causes motivation effect of illustrations by analyzing eye-tracking data.
- We found two routes that illustrations enhance motivation to read.
 - Gaze of illustrations route
 - Illustration size route
- We further research these processes in more detail.