

Chapter 11

Using Eye-Tracking Technology to Understand How Graphic Organizers Aid Student Learning

Linlin Luo

University of Nebraska – Lincoln, USA

Markeya S. Peteranetz

University of Nebraska – Lincoln, USA

Kenneth A. Kiewra

University of Nebraska – Lincoln, USA

Abraham E. Flanigan

University of Nebraska – Lincoln, USA

ABSTRACT

In the past three decades, several studies have found an achievement advantage for studying graphic organizers such as a hierarchy or matrix over studying linear displays such as a text or outline (e.g., Dye, 2000; Guri-Rosenblit, 1989; Kauffman & Kiewra, 2010). However, little was learned about how students study graphic organizers and the cognitive processes involved. Recently, the advancement of eye-tracking technology has provided a means to examine how students actually study graphic organizers and the types of processing that occur. The purpose of this chapter is to explore how eye-tracking technology can be used to understand how graphic organizers aid student learning. Specifically, this chapter introduces graphic organizer research and theory, reviews recent research that used eye-tracking technology to study graphic organizers, and offers future research directions.

INTRODUCTION

Although it has long been established that studying graphic organizers such as hierarchies or matrices results in higher achievement than studying linear text such as outlines (e.g., Dee-Lucas & Larkin, 1995; Guri-Rosenblit, 1989; Kauffman & Kiewra, 2010; Robinson, 1998), little is known about how graphic organizers are actually studied. More recently, investigators have used eye-tracking methods to determine how students study graphic organizers (e.g., Luo, Peteranetz, Flanigan, Witte, & Kiewra, 2014; Ponce & Mayer, 2014a, b; Salmerón, Baccino, Cañas, Madrid, & Fajardo, 2009). The purpose

DOI: 10.4018/978-1-5225-1005-5.ch011

of this chapter is to describe how eye-tracking technology is used to investigate how students study graphic organizers and to report what has been found. Toward that end, this chapter:

1. Introduces graphic organizers,
2. Reviews graphic organizer research and theory,
3. Specifies research limitations and the need for eye-tracking technology,
4. Reviews eye tracking in educational research,
5. Explores eye-tracking methods and findings related expressly to the study of graphic organizers, and
6. Identifies research limitations and proposes future research directions.

An Introduction to Graphic Organizers

Instructional information is commonly displayed in block form as shown in the paragraphs in Figure 1 about the solar system's first two planets. Alternatively, information is also commonly displayed in linear form as shown in the outline in Figure 2 for the solar system's next two planets. The problem with these common displays is that they obscure relationships. In this case, studying blocks or lines of planet information makes it difficult to recognize relationships among planets. For example, a learner would need to scan back and forth between paragraphs or between outline sections in order to compare information about the two planets being described.

It is also possible to display the planet information in a more graphic form. Graphic organizers display information more visually than conventional text and outlines. Graphic organizers compress seemingly disjointed information and convert it into a spatial structure that is easy to read and understand. A good graphic organizer reveals the intended message and the important relationships with only a glance (Guthrie & Taboada, 2004; Jonassen, Beissner, & Yacci, 1993; Robinson & Kiewra, 1995; Winn, 1991).

A more graphic display of the solar system information appears in Figure 3. This matrix organizer is superior to its block and linear form counterparts because it prompts planet comparisons and reveals integral relationships obscured by the competing forms. Rather than forcing a learner to jump back and forth between separate paragraphs or outline sections, a matrix places all related information together for easy comparison. With only a glance at the matrix, several planetary relationships are quickly revealed: As planets are positioned farther from the sun, revolution time

Figure 1. Planets text

Mercury is 36 million miles from the sun. Its revolution time around the sun is 3 months.

Its orbit speed is 30 miles per second. Its diameter is 3,000 miles. Mercury has a rocky surface. It has 0 moons. Its rotation time is 59 days.

Venus is 67 million miles from the sun. Its revolution time around the sun is 8 months. Its

orbit speed is 22 miles per second. Its diameter is 8,000 miles. Venus has a rocky surface. It has 0 moons. Its rotation time is 243 days.

17 more pages are available in the full version of this document, which may be purchased using the "Add to Cart" button on the publisher's webpage:

www.igi-global.com/chapter/using-eye-tracking-technology-to-understand-how-graphic-organizers-aid-student-learning/167542

Related Content

Individual Differences, Learning Opportunities and Learning Outcomes, Digital Equity: Bridging the Gap – Creating Learning Opportunities for All Students

Amy L. Sedivy-Benton (2016). *Handbook of Research on Learning Outcomes and Opportunities in the Digital Age* (pp. 266-286).

www.irma-international.org/chapter/individual-differences-learning-opportunities-and-learning-outcomes-digital-equity/142380

Retention of Online Learners: The Importance of Support Services

Pamela A. Lemoine, Gina Sheeks, Robert E. Wallerand Michael D. Richardson (2019). *International Journal of Technology-Enabled Student Support Services* (pp. 28-38).

www.irma-international.org/article/retention-of-online-learners/244209

Antecedents of Instructor Intention to Continue Using E-Learning Systems in Higher Learning Institutions in Tanzania: The Influence of System Quality and Service Quality

Deogratius Mathew Lashayoand Julius Raphael Athman Mhina (2021). *International Journal of Technology-Enabled Student Support Services* (pp. 1-16).

www.irma-international.org/article/antecedents-of-instructor-intention-to-continue-using-e-learning-systems-in-higher-learning-institutions-in-tanzania/308461

Student Engagement Awareness in an Asynchronous E-Learning Environment: Supporting a Teacher for Gaining Engagement Insight at a Glance

Abdalganiy Wakjiraand Samit Bhattacharya (2022). *International Journal of Technology-Enabled Student Support Services* (pp. 1-19).

www.irma-international.org/article/student-engagement-awareness-in-an-asynchronous-e-learning-environment/316211

Pre-Service Teachers' Perceived Relevance of Educational Technology Course, Digital Performance: Teacher Perceived of Educational Technology

Ogunlade Bamidele Olusolaand Bello Lukuman Kolapo (2019). *International Journal of Technology-Enabled Student Support Services* (pp. 41-54).

www.irma-international.org/article/pre-service-teachers-perceived-relevance-of-educational-technology-course-digital-performance/236073