The impact of infographics on understanding of scientific topics based on artistic elements

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Introduction

Infographics are forms of communication that use images and text to explain a concept or topic, and can display a very complicated subject in a cohesive, and understandable way. For this reason, they have become a very popular approach of data communication (Dunlap & Lowenthal, 2016). They are widely used because they are efficient and easier to remember than text, a concept known as the Picture Superiority Effect (Naparin & Saad, 2017). Infographics are often used to explain scientific topics. One such example is the Chesapeake Bay watershed. The Chesapeake Bay watershed is an estuary spanning 64,000 square miles from New York to Virginia, with a population of about 17 million. Land use has become increasingly urbanized, which introduces large amounts of pollution by way of runoff. As more areas are cleared to provide land for cities and agriculture, the watershed also loses its ability to filter the runoff.

The purpose of this project was to observe how infographics impact understanding of land use of the Chesapeake Bay watershed. It was hypothesized that the artistic elements that affected understanding the most were color and text density, with the relationship being direct for color and inverse for text density.

Materials & Methods

Three different infographics were created, each centered around different artistic elements: color, text density, and formatting respectively. The infographics were static, meaning the viewer did not need to interact with the images, they did not follow a linear sequence, and were not 3-dimensional. The materials for creating the infographic were traditional art supplies: pens, pencils, and colored pencils.

For each graphic, a sketch was completed and proposed to mentors. The graphics were approved on a case-by-case basis. If there were errors or areas that needed improvement, another sketch was created. This process repeated until a satisfactory design was made. Following the completion of the sketch, the images were then scanned and refined digitally. Text and text boxes were also added in the digital editing process.

Materials & Methods (cont.)

Each sketch was completed by the end of its respective month, and each graphic at most required two different sketches to refine them. Upon completion, each graphic was printed at a larger scale of approximately 42 in. × 30 in. in dimension. To test the effectiveness of the infographics created, subjects were randomly assigned to one of the three different infographics, or a narrative that was solely text. Graphics 1 and 3 are shown in Figures 1 and 2. Graphic 2, the formatting graphic, is not shown. Each subject was given five minutes to view the infographic and complete a ten-question assessment. All of the questions were addressed in all of the materials. The number of correct answers were recorded, the distribution of these scores portrayed in Graph 1. The number of subjects was distributed evenly throughout the infographics, and after a sufficient number had been observed (n = 30), a one-way ANOVA test and a Tukey post-hoc test were conducted on the data. From this and the differences between the elements the infographics used, it was determined what influences the effectiveness of infographics the most.

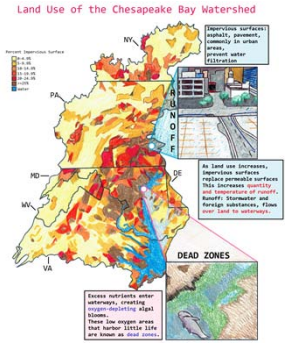
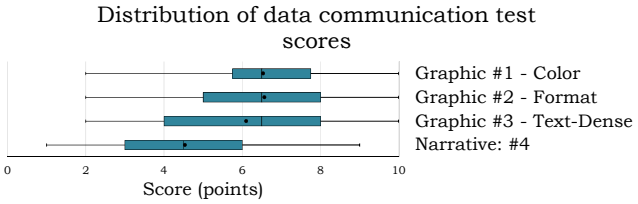


Figure 1 (above, left): The completed first infographic. The element of focus in this image was color, as the color served specific purpose, culminating in both the map and text. However, reliance on a map was more implicit, which may have been an unexpected variable introduced.

Figure 2 (above, right): The completed third infographic. Compared to the other graphics, the amount of text was greater. This was hypothesized to be the least effective infographic, because of such high amount of text. However, the material explicitly answered all of the questions.

Results

There was a significant variance in effectiveness, as determined by the one-way ANOVA, (F (3, 119) = 5.89, p = 0.001). As determined by the post-hoc test, the narrative was statistically different from Graphic 1 (p = 0.003), Graphic 2 (p = 0.002), and Graphic 3 (p = 0.030). However, Graphic 1 was not significantly different from Graphic 2 (p = 1.000) or Graphic 3 (p = 0.859). Graphic 2 was also not significantly different from Graphic 3 (p = 0.830).



Graph 1 (above): The means of the three graphics, 6.533, 6.567, and 6.100 did not vary significantly, but all of them are significantly different from the narrative's, 4.533. Despite having a similar mean to the other graphics, Graphic 3, the text-based graphic, had the largest standard deviation, being 2.325, compared to 1.737 and 2.176 for Graphics 1 and 2 respectively, and even the narrative's 2.208.

Conclusions

The data suggested that there was a statistically significant difference between the infographics and the narrative. However, there was no significant difference in the effectiveness of the graphics between each other. This suggested that when wielded well, the infographics can effectively convey information, independent of its elements. For future studies, it could be observed if the aspect of implied information affects graphic effectiveness, as that potentially affected the data.

References

Dunlap, J. C., & Lowenthal, P. R. (2016). Getting graphic about infographics: Design lessons learned from popular infographics. *Journal of Visual Literacy*, *35* (1), 42–59.

Naparin, H., & Saad, A. B. (2017). Infographics in Education: Review on Infographics Design. *The International Journal of Multimedia & Its Applications, 9,* 4–6.