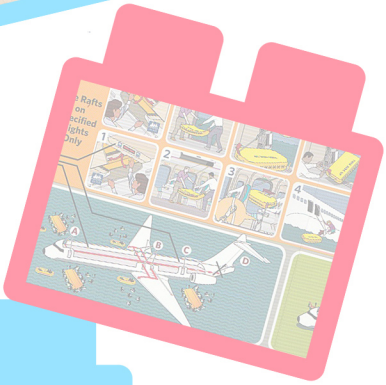
Globalizing Instructional Design:

Building better understanding through visual elements



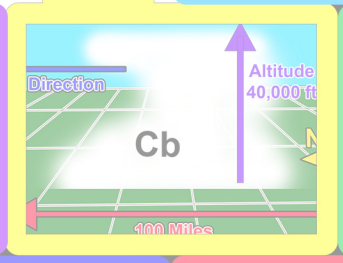


Table of Contents

Abstract

In the following text the author provides a brief glimpse into the usefulness of graphic imagery when employed for the purposes of technical communication. The first section provides historical examples of graphic imagery. The second portion outlines a review of pertinent research on image effectiveness in learning. The third section provides examples of wordless diagrams commonly used in contemporary society. The fourth topic briefly explores potential problems with the use of imagery. And finally, a conclusion ties these themes together. A traditional bibliography has been included.

Definition of Document Design

Document design encompasses the obvious design choices made by the creator such as graphics, diagrams, illustrations, line graphs, pie charts, frames, statistical charts, images, and photographs, etc.

It also includes non-obvious design choices such as heading fonts, subtopic fonts, font colors, text body fonts, language choices, spacing, spelling, complexity of the language, font size, appropriate grammar, stylistic choices (provided by a style guide), readability decisions for viewers with disabilities, and illiteracy considerations.

Consistency in design choices is key. All aforementioned items are universally true regardless of media being used whether in writing, video editing, marketing posters and brochures, manuals, scholarly works, and educational pieces.

Historical Relevance

Why are graphics, illustrations, diagrams, graphs, charts, and frames essential tools for the modern technical communicator, and what benefit is provided by their inclusion? Why is the written word often "not good enough" for explaining complex technical concepts? What distinguishes early linguistic expression from graphics that convey technical information, and when did graphics first emerge to support complex technical explanations?
A rough timeline of examples can inform us of relative milestones in "visual" technical communication. By starting with a brief review of history we can provide a framework for the answers to these questions and more!

The most well-known historic example of "graphics" is the ancient hieroglyphics of Egypt. This early form of "visual" communication became standardized, and subsequently fashioned into a readable "language." Hieroglyphic representations told the stories of pharaohs, their pantheon of gods, views of life and death, and ultimately the Egyptian people themselves. (Perry et al. 18). Though interesting, this example is less pertinent to "visual" technical communication, and more relevant to a discussion concerning ancient art and writing systems.

A better example takes us across the world to China, where some of the earliest known technical graphics emerged during the Song and Yuan dynasties 960 - 1368 CE. According to Peter Golas these technical images included "diagrams, figures…[and] schemata." Though graphics were in common use during this early period, technical communicators often reverted to written explanations when the subject matter was regarded too complex for pictures (Golas xxiii).

Figure 1: The Map of the Tracks of Yu

The Map of the Tracks of Yu (see figure 1) was carved in stone approximately 1100 CE and is the most sophisticated map rendered by any culture of that time. Lines of longitude and latitude were carefully measured. The coastlines and rivers were scaled proportionally to the landmass depicted, and a legend was provided to indicate significant measurements and places of importance (Tufte 14).

During the Western Renaissance, an intensive exploration of the human anatomy began to find expression in artistic works. This coincided with the origins of document formatting in 16th century England. These were rudimentary works of science, taxonomy, anatomy, astronomy, and "how-to" books (Tebeaux 3).

A well-known artist of Flemish descent named Andrae Vesalius rendered some of the first comprehensive medical technical images describing human anatomy. His prolific work is still utilized in gross anatomy textbooks today (Kean 27-40).

In the late 19th century, a demand for a literate workforce prompted many western governments to enact educational programs. The increase in a literate population created a greater need for effective instructional explanations and technical communications (Stearns 64-65).

By the early 20th century, a proliferation of marketing and instructional materials could be found in the general popular market. A fun piece of trivia from that era is the advertisements for "built-it-yourself" homes. You could order a home from the Sears & Roebuck catalog, which would then be shipped to your location via freight train (see figure 2). An example of the floorplan was included in the marketing brochure, and an illustrated instruction manual was included with the building materials (Kyvig 58-59).

Figure 2: Sears and Roebuck Gladstone Home

In 1955 the Danish toy company LEGO began producing LEGO System in Play. These toy brick sets featured the characteristic "stud and tubes." Included in each set was a wordless set of instructions. It succinctly guided the builder through each step via illustrations, numbers, and simple symbols. Godtfred Kirk Christiansen, the owner and managing director of LEGO, stipulated that the sets must be "suitable for children of all ages and for both boys and girls." (LEGO System in Play).

By the 1980s, computer images derived from pure mathematical data became widely accepted. Meteorologists were now able to demonstrate natural weather phenomena in colorful graphics for popular dissemination (Tufte 20). This trend in computer aided graphics has continued into the 21st century. These images are now a composite of mathematically generated models and hand drawn sketches. Current technical visual design is a mix of ancient artistic traditions and modern computing tools (Henry 8). Despite the efficiency of computers, the human component remains critical to communicating meaningful nuance.

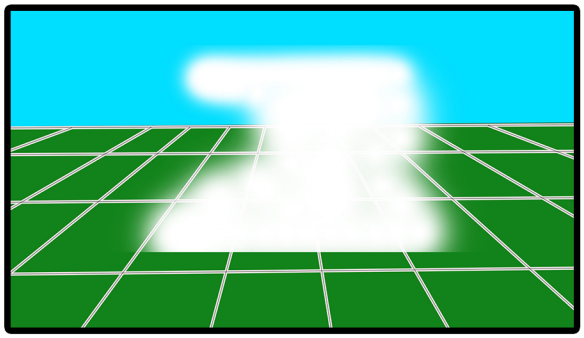


Figure 3: Mock-up of a computer simulation

In figures 3 and 4 a mock-up of computational weather imagery was rendered in photoshop. These images are based upon Edward Tufte's examples from Visual Explanations (pages 20-21). Figure 3 represents a 3D model rendered by computational data. The data gives the "cloud" its shape and relative size and height, but there is important information that is missing.

Humans decide what information is relevant to a target audience, not the computer. In figure 4, details such as height, width, direction of movement, orientation, and even type of cloud transforms the image seen in figure 3 into a "living and breathing" picture. The viewer can now

infer many assumptions about this weather phenomena, and even predict future behaviors (Tufte 20-21).

This last example demonstrates the educational power of imagery when paired with text. Images can make a topic become real to the viewer, and ultimately enhance a reader's learning potential.

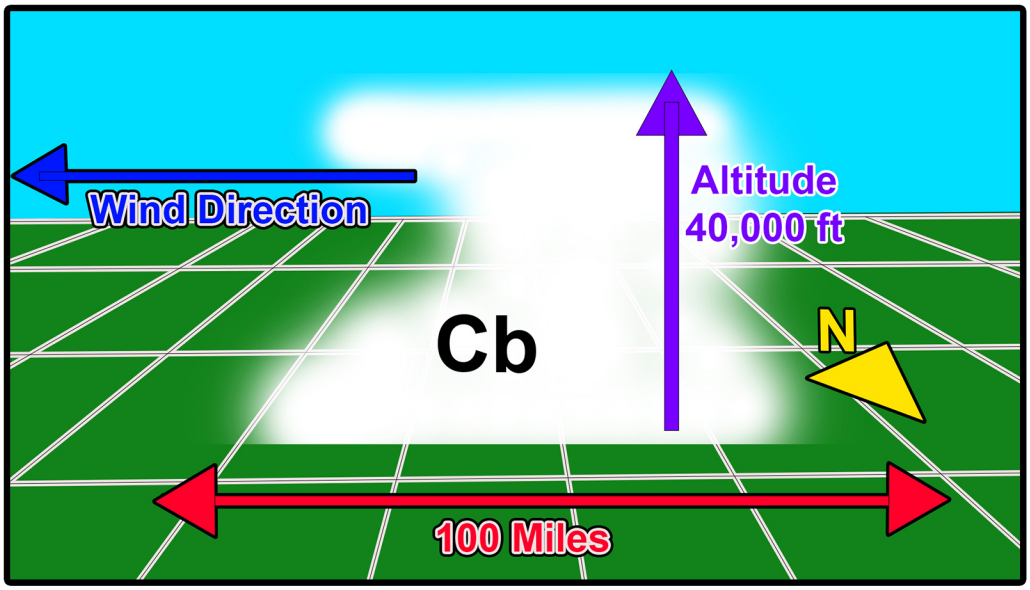


Figure 4: Mock-up of a computer simulation with the "human touch"

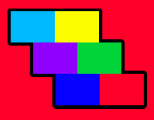
Figure 5: Picture of a Real Thunderstorm, (Galinda WMC Action News 5)

Efficacy of Technical Imagery

A research review conducted by Howard Levie and Richard Lentz drew on the results from 55 experiments aimed at discerning the effects of images as educational tools. A broad conclusion of this research was that images paired with text evoke a positive emotional response among viewers, and therefore improved learning. More specific findings involved improvement in comprehension, retention, aid for poor reading skills, and direction of eye movement. These were the conclusions drawn by Levie and Lentz:

- All studies reviewed, used a variety of testing materials. This included writings varying from basic children's stories to complex scientific journals.
- All manner of graphics provided a bonus to learning (i.e. color photographs, line graphs, frames, and diagrams, etc.).
- Twenty-three of the studies provided "text-only" documents in contrast to "text-illustration" documents (control vs. treatment group).
- Across the twenty-three studies, "text-illustration" documents showed a consistent 36%increase in learning.
- Illustrated documents were consistently superior to text-only documents.
- "Fun" imagery such as non-text relevant cartoons did not enhance learning, however respondents favored the "fun" illustrations as an added perk to learning.
- Other studies reviewed, demonstrated that texts beginning with a relevant graphic improved the context for understanding the subsequent text.
- Title headings and subtopic headings also improved learning.
- Ninety-eight percent of all research showed favor towards illustrations.
- The inclusion of non-relevant pictures (such as photographs, images, and artwork) did not decrease learning.
- An increase in illustration relevance was correlated with an increase in reader comprehension.
- Images with captions improve the recall of the target information.
- Maps that relayed spatial and geographic information increased learning by 60%.
- Overly complex maps and diagrams (beyond the intended focus) can negatively affect learning.

Most astoundingly, research participants who were asked to draw pictures of the content (from text-only sources) also gained a 30% increase in retention. Imagery included with texts produced benefits that far outweighed potential negatives (Levie and Lentz 195-232).



A Step Further: Imagery that Supports Globalization

So far, the discussion has centered upon graphics paired with texts. But what power can an image possess when it is the sole means of transmitting information? And how can imagery encourage inclusiveness in a global community?

The LEGO example mentioned in the previous section is quite relevant for our purposes here. To include wordless instructions with only illustrations, seems counterintuitive in a literate western world. However, this model fits perfectly with Godtfred Kirk Christiansen's goal to market to children of all ages and genders. (LEGO City).

From Christiansen's goals we can make an educated guess about his reasoning: not all children are of reading age, therefore wordless instructions will engage all age-groups who wish to play.

The second part of Christiansen's statement was LEGO was intended for both "boys and girls." This is interesting to consider. Whether intentional or not, the exclusion of words in the building instructions (no matter how benign) may have precluded a gender bias.

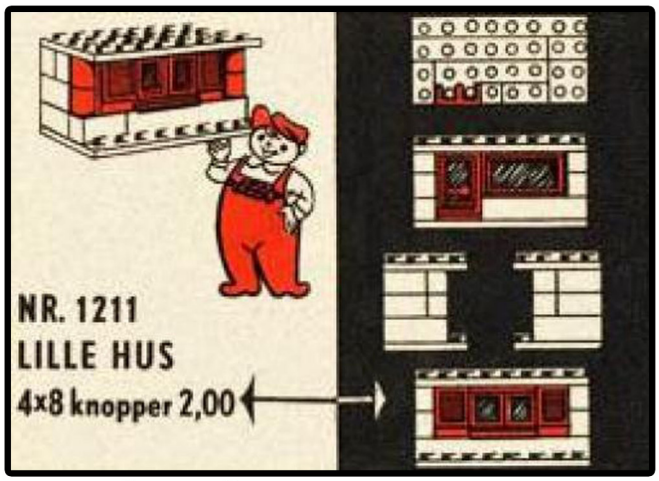
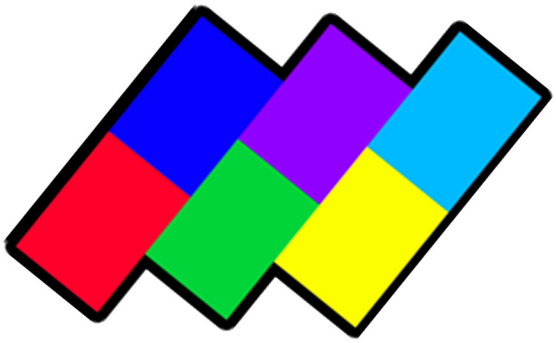


Figure 6: "lille hus" (small house) LEGO set from 1955

Figure 6 pictures the instructions from the "lille hus" LEGO set from 1955 (LEGO Group, lille hus). Notice the sexual ambiguity of the person and the sparse verbiage describing the kit. No gender role is assigned. In our current age, LEGO remains a fun and viable toy for all gender orientations.

This can be taken a step further. Wordless instructions are the perfect springboard for globalization. By devising a system of symbols and instruction methodologies LEGO has produced a product that crosses many different languages, cultures, literacies, age groups, and gender classifications. Even mental health groups have adopted LEGO play for children with developmental disorders (Rudy 1-17).



Wordless Instructions in Action

The elegance of wordless instructions can be easily demonstrated. Figure 7 is an excerpt from LEGO kit #21322: Barracuda Bay. This image shows basic instruction for the combination of five bricks. To most readers these instructions are self-explanatory (LEGO Group, Barracuda Bay).

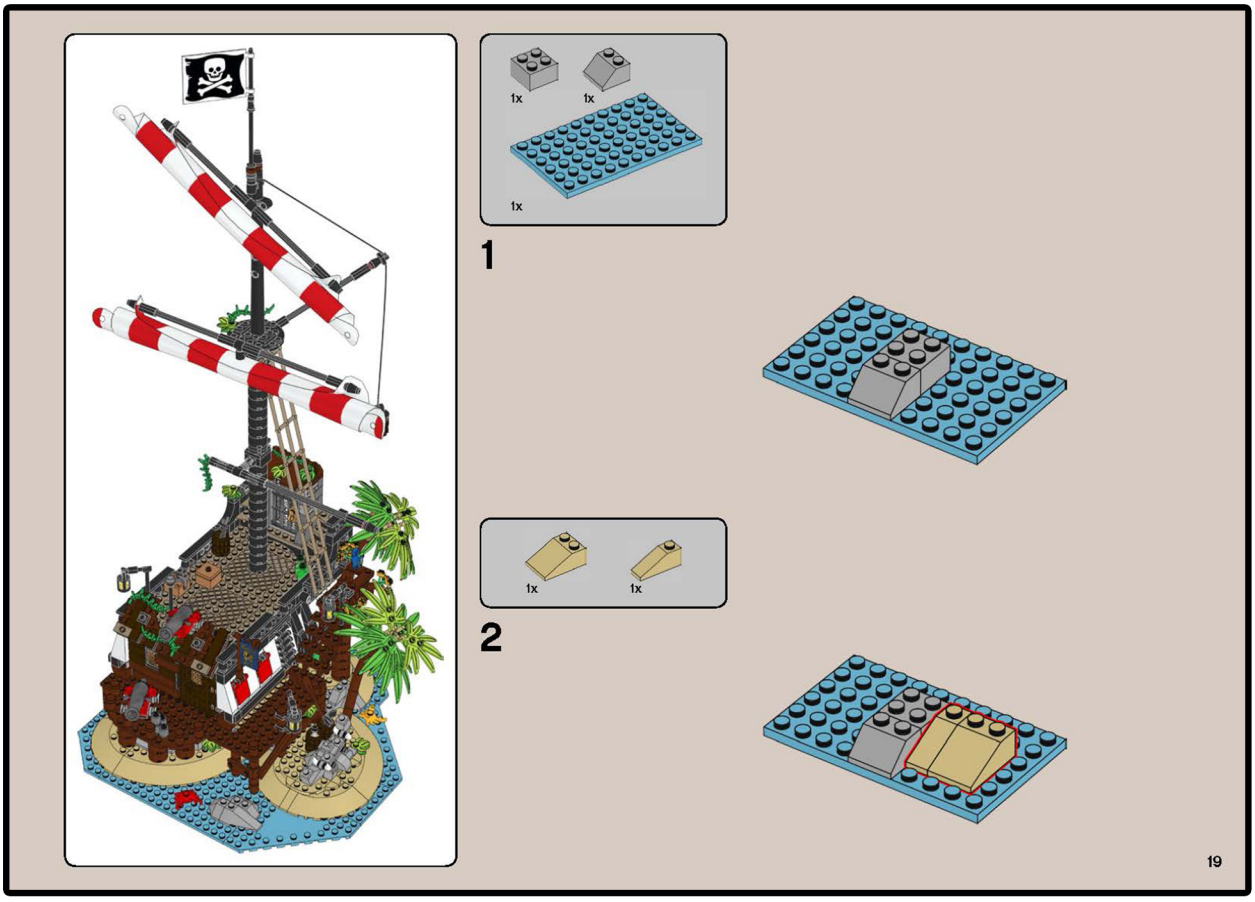


Figure 7: Barracuda Bay, LEGO kit #21322

Imagine these same instructions if written in words:

In Step 1, please locate these brick shapes: (1) two-by-two normal sized brick with four studs on top, (1) two-by-two normal sized brick with a diagonal slant, and with only two studs on top, and (1) 6 stud x 10 stud flat plate.

Now, attach the two-by-two normal sized brick with four studs on top to the 6 stud x 10 stud flat plate. The two-by-two normal sized brick with four studs on top should be placed exactly in the middle: you should be able to count four studs to the left, and four studs to the right lengthwise, and you should be able to count two studs on the front, and two studs on the back width-wise…

We have barely completed Step 1 and this language is already confusing! Even with an economy of language, written instructions quickly become convoluted and difficult to read. A text-only author would be required to name the brick shapes, and to explain their exact positions of contact. Naming each LEGO brick would be an incredible task. There are over 3,700 unique bricks and elements being produced worldwide (Bricks Fans).

Another salient example of the power of imagery can be demonstrated in flight safety cards. Figure 8 is the safety card instructions from a Delta MD-88. Notice that the language is sparse. Most of the instructions are numbered for each potential hazard and are limited in pictures so they can be easily memorized (Delta Airlines).

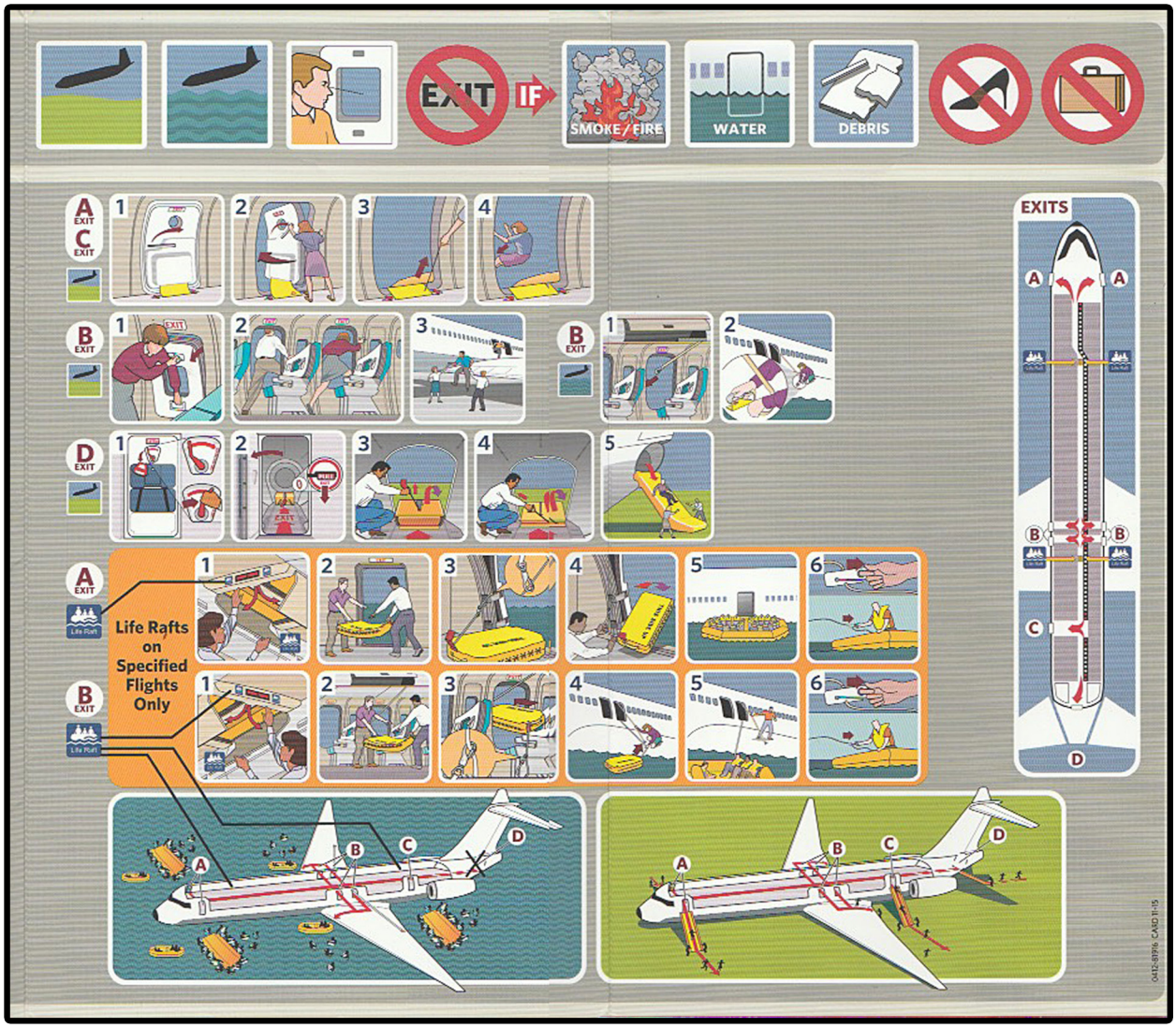
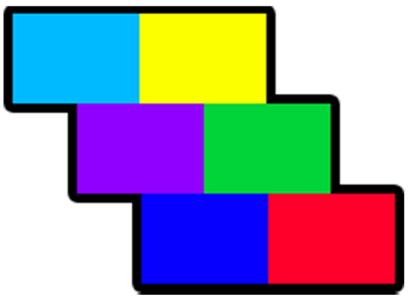


Figure 8: Delta Airlines safety card

The economy of language in the safety cards is important for several reasons:

- Airlines transport passengers of all ages, levels of literacy, cultures, and languages across the globe.
- The card must fit in the seatback in front of each passenger and be easily accessible.
- The card must be printed on paper literature that is easily replaceable if lost or damaged.
- The card must be quickly readable in the event of an emergency.

Figure 9: Turkish Airlines partners with LEGO to create a safety video (Russell)



When Imagery is a Problem

The use of images can be detrimental to your message if not chosen carefully! Consider this map created by cartographer Petrus Bertius in figure 10. The map depicts the sailing passage of Ferdinand Magellan between Tierra del Fuego and the southern tip of Patagonia in 1520.

Notice the size of Tierra del Fuego in relation to Patagonia. When compared with modern maps the proportion between the two land masses is inconsistent. The cartographer's emphasis was meant to convey the area's relative importance, not actual size. That importance reflects Magellan's accomplishment: sailing directly from the Atlantic to Pacific Ocean.

The unintended consequence of this depiction is that it influenced the persistent belief among European explorers that Tiera del Fuego was geographically as large as Argentina,

Figure 10: Tierra del Fuego and Patagonia: The Straits of Magellan 1602

and therefore impassable (around the southern tip of South America)! This map also contributed to the popular myth that giants lived in South America (Bertius 28).

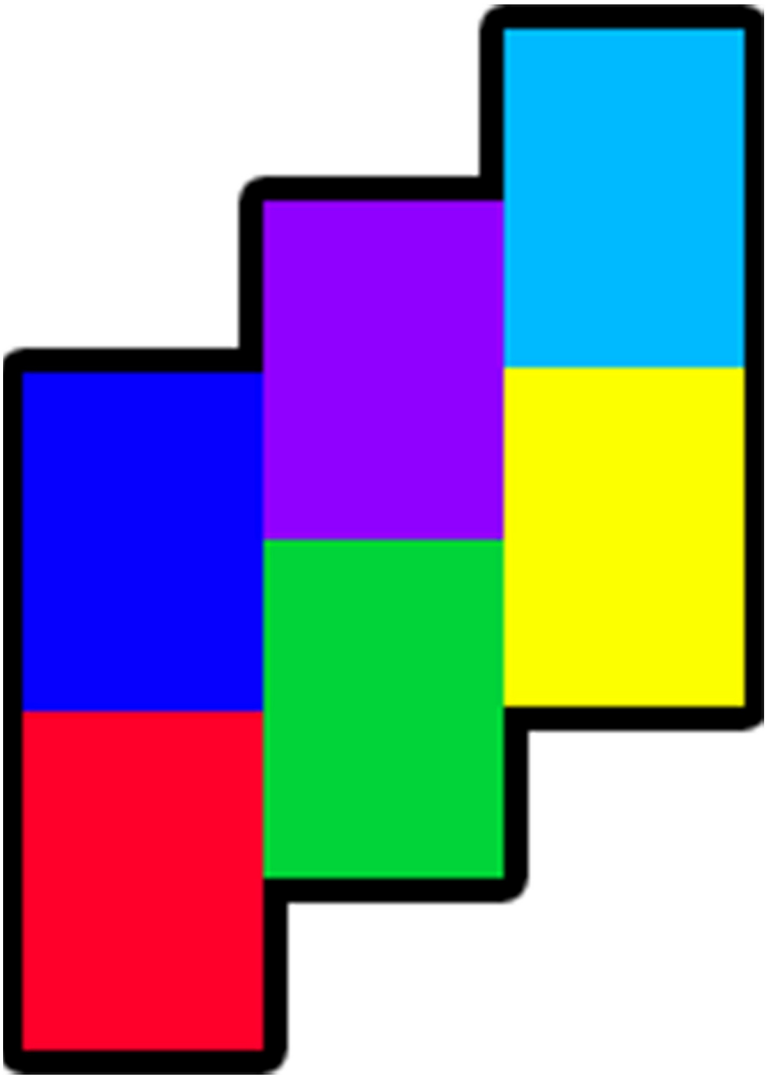
The point to be taken here, is that unbalanced emphasis on items depicted can greatly contribute to misinterpretation of the intended message. The inferred gravitas of this professional cartographer, the relative inexperience of the general populace with sea travel, and the presence of mythmaking all contributed to this confusion.

Conclusions

Graphic imagery is a mainstay of technical communication. It has been employed to convey complex information throughout the centuries. Research has soundly demonstrated that including graphic imagery produces substantial benefits to the reader.

However, images do not have to be paired with the written word to be effective. Images themselves can transmit information across languages and culture.

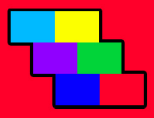
As image rendering technology becomes more advanced, and globalization becomes a more tangible reality, technical communicators should champion the use of imagery, and continue to refine methods that are economical in presentation, yet profound in meaning.



Ethical Problems

Many of the following ethical issues were drawn from Bill Katzenstein's website Iconic Photo: Architectural Photography. Though his intention was to promote ethical photography, many of his points can be adapted to graphic imagery used by technical communicators (Katzenstein ethical issues). While most of these points are interpretations from his work, a few commonsense items were added.

- An image intentionally misrepresents the data being presented. For example: you are a technical communicator in Aviation. You must meet a tight deadline and you do not want your boss to be angry, so you use an image that is misleading to "skew the numbers." The airplane fatally crashes because this information was inaccurate.
- An image is used for government propaganda to bolster political rhetoric. You create a diagram that supports a political position but omit critical details that hurt your position.
- An image is used for profit depicting other people's misfortune. You snap a photo of a home burning in the California wildfires. That photo is later used in a marketing campaign not related to the wildfires.
- You destroy property/nature for the purpose of creating an image. You intentionally set the California wildfires so that you could produce the "perfect image."
- Using copyrighted images that do not belong to you without permission, or without properly citing for academic purposes. This ethical crime is committed by pulling an image from Google Images and not properly citing the source or asking permission.
- Using software (such as Adobe Photoshop/Illustrator) to alter or misrepresent the original image. The image belongs to someone else, but you alter it to make it appear your original.
- Using images out of context from their actual context. This item is similar to images for political propaganda. Example: an image of a dead Somali pirate is cropped for the narrative that he was a peaceful protestor, when in fact the cropped portion of the image shows he is holding an AK-47.
- Using software (such as Adobe Photoshop/Illustrator) to add features to images that previously did not exist. Perhaps you are trying to meet a tight timeline. The original designer provides you with an illustration that is accurate, but you know your boss will not like it, so you alter the images with pleasing features (even if they are inaccurate).
- Using an image that was given to you privately by another creator, but without consent. A friend sends you a private message with family pictures of his trip to Hawaii. You find a great picture of Waikiki. The image is now in your "possession" so you use it as if you were the photographer.



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