CHAPTER

1

Like a Hand in Glove

"The need for clear and imaginative communication has never been greater."
— Phillip B. Meggs

THE FRAMEWORK

THIS CHAPTER answers these questions:

- Why do visuals benefit learning?
- How can I use visuals to improve learning?
- What is the impact of visual design on learning?

Learning design and visual design go together like a hand in glove. They are a perfect fit for each other, yet it's rare to hear the terms spoken in the same breath. Even those who acknowledge that graphics are essential for learning may not be aware of the reverberations that visual design has throughout a learning experience. Visual design affects the quality of learning, the value of the communication, and the motivation of the audience members. It leverages the brain's innate capabilities, improves engagement, and satisfies the audience's aesthetic sensibilities.

In this chapter, you'll gain a better understanding of why graphics benefit learning and how design affects the overall user experience.

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THE VISUAL BRAIN

There's something special about vision. Together the eye and brain work in ways that are no less than wondrous. Consider this. Our eyes are in nearly constant movement, but we rarely notice it. We rapidly recognize objects in complex scenes regardless of their size, color, position, and rotation.

We perceive depth precisely because a different image is registered with each eye. In normal vision, we see six million different colors and lots of detail, both close up and at a distance. We see with different acuity levels depending on the task we are performing (Kosslyn, 1994). We adapt to a wide range of light intensities, so we can see at dusk and also in bright light. And all of this occurs with little to no conscious awareness.

Scientists estimate that over 50 percent of the brain's cortex (the outside layer) is involved in visual processing (Snowden & Thompson, 2012), whereas auditory processing uses around 10 percent and the other senses use even less. Thus, our brains devote more resources to vision than to any other sense.

The pure physiological power of our visual system is a compelling argument for ensuring that you take advantage of the audience's visual intelligence as you design learning experiences.

BENEFITS TO LEARNING

What happens when you look at a picture? (See Figure 1.1.) The process starts when your eyes pick up sensory data and send signals to a sensory register (also known as sensory or iconic memory). The information lasts here for less than a second and is sent to working memory. Through perceptual processes you select what to pay attention to, based on the features that catch your eye (during pre-attentive processing) and the visual patterns that are meaningful to your goals (during attentive processing).
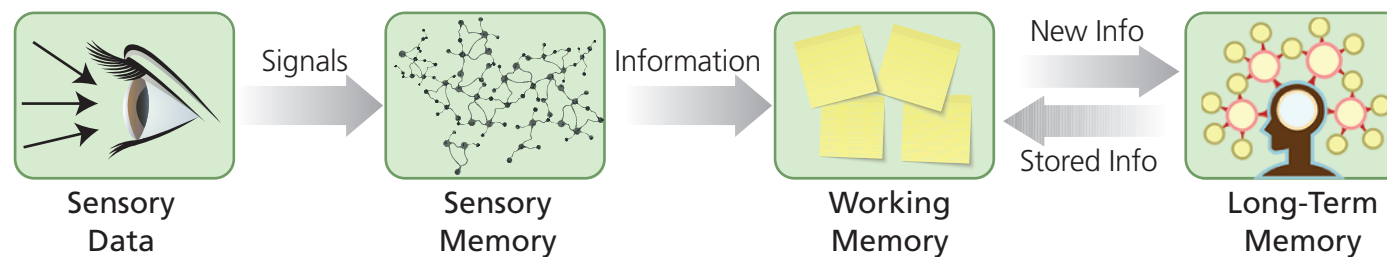
FIGURE 1.1.   *How we process visual information.*

As you scan the picture, visual chunks are held in working memory for a few seconds. With help from your past experience and knowledge stored in long-term memory, you decode these marks on the screen or page. If the picture is easy to understand, this process happens rapidly. *Visual perception is faster than thinking*.

Research shows that text accompanied by relevant visuals is better for learning than text alone in many situations and under many conditions (Mayer, 2009). Pictures can strengthen visual discrimination by emphasizing important details. Visuals improve retention and aid in problem solving. Abstract visuals help people comprehend complex information and assist in building mental models. In fact, if you break the learning process down into smaller cognitive actions, you'll see that visuals can be valuable nearly every step of the way.

Pictures Capture Attention

Pictures are magnets for attention regardless of the medium. People usually look at the graphics of a web page before they read the text (Lin, Yeh, & Wei, 2013). The same is true for newspaper advertisements. Consumer research shows that pictorial ads are better at capturing attention than text ads, and this is true regardless of picture size (Goodrich, 2010; Pieters & Wedel, 2004).

In learning and information dissemination, pictures also draw attention. For example, in a study that explored the best way to convey messages about health risks, pictures attracted and held attention for a longer period of time than the same information produced in text alone (Smerecnik, Mesters, Kessels, Ruiter, De Vries, & De Vries, 2010).

Pictures of people and particularly pictures of faces summon our visual attention. Also, certain attributes capture attention without conscious awareness. Vivid colors, striking shapes, and motion capture pre-attentive attention.

Visuals Aid Recall

Encoding information in long-term memory is an essential activity of learning, and this is one more place where visuals shine. Relevant pictures help people remember corresponding text. By relevant, psychologists mean pictures that represent the objects or concepts presented in the text (Levie, 1987).

This may be due to the fact that our memory is typically better for concrete things than for abstractions. Pictures provide a concreteness—an association with a sensory experience—that has advantages over words, which are more symbolic.

Visuals Improve Comprehension

Pictures help learners understand complex text or narration because they convey information about spatial structure. We rely on the spatial structure of visuals to provide meaning. In a diagram or chart, designers use techniques that show relationships, such as placing related elements together in a group. This quickly communicates what is associated in a way that may be more difficult

through text alone. The structural organization of a picture is thought to have a scaffolding effect that helps in the construction of new mental models (Eitel, 2013).

Because graphics hold attention for a longer period of time than text, researchers believe the additional attention plus the ease with which graphical information is extracted is another benefit to comprehension (Smerecnik, Mesters, Kessels, Ruiter, De Vries, & De Vries, 2010). Also, pictures can be rendered with extreme specificity. They can emphasize or exaggerate details to reduce ambiguity. This precision improves understanding.

Making Inferences

Certain types of graphics, such as information graphics, facilitate making inferences and solving problems. They function as an external memory aid by using arrangements that organize information in meaningful ways (Larkin & Simon, 1987). It is easier to make use of massive data when it is expressed as a graph. It is easier to work with a complex network of ideas when they are illustrated in a diagram.

Acquiring Skills

In terms of learning procedures, the combination of pictures and text is ideal. One study showed that line drawings and text were as effective as video when the drawings used arrows to show the actions involved in performing a simple medical procedure (Michas & Berry, 2000).

Looking at the range of cognitive tasks that adults perform, it becomes obvious that graphics support and facilitate thinking, problem solving, and learning. Regardless of whether the graphic is a simple icon, an elaborate illustration, or a complex data visualization, visuals provide a rich and textured language for expressing ideas.

THE PICTURE SUPERIORITY EFFECT

The value of visual design becomes clear when you consider the *picture superiority effect*. Several decades of research have established that in most recall and recognition memory tasks, concepts that are learned by viewing pictures are remembered better than their counterparts in words (Hockley & Bancroft, 2011). This phenomenon is known as the *picture superiority effect*.

Possible Reasons for Picture Superiority

Dual coding. Why do visuals add an element of memorability to information? One theory, known as *dual coding*, states that people process information through two distinct systems, one for verbal information (written and spoken words) and one for non-verbal information (images). According to this theory, pictures have an advantage over words by being encoded into long-term

memory through both the visual and verbal channels. That is, pictures are encoded as an image as well as spontaneously given a verbal label. In contrast, words are encoded with just one verbal code (Paivio, 2006). Two codes written to memory increases the chance of retrieving the information compared to information that is coded in only one way (Paivio, 1986).

This theory would also explain why the picture superiority effect improves with chronological age. If a person does not have the inner language available to formulate a name for a picture, then dual coding does not seem to occur (Whitehouse et al., 2006).

Perceptual distinctiveness. Another theory explains picture superiority as a result of the distinctive visual appearance that images have when compared to text. The drawing of an object, such as a tree, can have infinite variations. Compare this to text, which must be visually homogenous to facilitate reading. The varied features of pictures could be encoded more distinctively in memory than words and be responsible for their memorability.

Leveraging Picture Superiority

The use of both pictures and text or narration is often the most effective choice in learning design. When pictures can convey the same or additional information as words in a meaningful way, they will augment the learning experience. Here are some of the many ways to use visuals to enhance learning:

- Use relevant visuals to represent concrete objects explained in text or narration.

- Use visual analogies to relate unfamiliar concepts to previously learned information.

- Show two or more things that need to be remembered in association with each other.

- Leverage the features of spatial layout to bring order and structure to information.

- Focus on the aesthetics of visuals to increase motivation.

- Use visuals for low literacy audiences or for those who speak a native language that differs from the materials.

VISUAL DESIGN IMPACTS EMOTIONS

One aspect of instructional science that is growing in importance is the consideration of a learner's emotional state. This is another area where visual design has impact. Consider your own experience with a well-designed product. Have you ever been delighted by a new app that feels intuitive or a device that works without having to look at the manual? The experience creates a positive emotional state that carries over to your judgment of the product. People use feelings as information, just as they use facts.

Likewise, learners make subjective judgments about their experiences based on how easy materials are to use and process. A well-thought-out visual design contributes to a favorable experience that influences a learner's attitude and motivation toward learning tasks. A learner will be more attentive and engaged with highly usable materials, compared with those that are frustrating or unappealing. Effective visual design impacts learning success.

AESTHETIC PLEASURE AND MOTIVATION

Aesthetics may not be the first thing practitioners consider when designing learning experiences, but the pleasure derived from an elegant design can't be ignored. Aesthetic pleasure—the pure appreciation of beauty—produces an enjoyable experience that is yet another demonstration of the value of visual design. Like a usable design, one that is aesthetically appealing has the potential to keep learners feeling positive, interested, and motivated.

We are attuned to aesthetics at a very basic level. In his book, *The Design of Everyday Things*, Donald Norman (2013) points out that we are affected on a visceral level by our immediate perception of an object, causing it to attract or repel us. The rapidity of feelings people experience upon immediate exposure to a design trumps the slower nature of cognition and frames subsequent thoughts (Pham, Cohen, Pracejus, & Hughes, 2001).

The importance of aesthetics in the design of websites, software applications, and mobile apps has grown to the point at which a beautiful design and elegant interface are considered part of effective implementation. Yet this trend has been slower to affect the world of learning design, even though there is research to support the importance of aesthetics.

For example, early research into how aesthetics can affect multimedia learning shows that the use of certain colors and shapes can induce positive emotions that people maintain while viewing instructional materials (Um, Plass, Hayward, & Homer, 2012).

Just as marketers seek ways to provide enjoyable experiences to gain and retain consumers, learning professionals can design materials to delight their audience. We can learn from consumer products and design learning materials with the same aesthetic sensibility of a product going to market.

THE TAKEAWAYS

- Our brains devote more resources to vision than to any other sense.

- Visuals capture attention, aid recall, improve comprehension and interpretation, and help with skill acquisition.

- The picture superiority effect demonstrates that pictures are remembered better than their counterparts in words in most recall and recognition memory tasks.

- An effective design can create a positive feeling in users, influencing their judgment and evaluation of a learning experience.

- Appealing designs can increase positive emotions and motivation because they speak to our appreciation of beauty.