

Using Visual and Graphic Elements While Designing Instructional Activities

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The time and expense of creating and obtaining visual/graphic elements, or pictures, for use within instruction is not insignificant. Then why use visual or graphic elements during instruction at all? The use of pictures during the design of instructional activities has been shown to have a significant impact with regard to both increased learner motivation and improved learning outcomes (Carney & Levin, 2002). Pictures and graphics can serve to convey information to the learner directly or facilitate the learner's understanding of related textual information within the instruction. Different types of visual and graphic materials are particularly suited for specific functions during instruction, and there are well-established design considerations for their use within instructional activities to increase their effectiveness. The use of pictures and graphics plays an important role in helping to manage the intrinsic cognitive load and reducing the extraneous cognitive load experienced by learners, who are then able to devote mental resources to learning the material within the instruction (Sweller et al., 2019).

The Role of Visual Messages in the Communication of Information

In order to be intentional about the use of visual and graphic elements during the design of instruction, it is important to first consider some of the fundamental concepts related to the role of visual messages within the communication of information more generally. What exactly is a picture, and what purpose does it serve? Knowlton (1966) proposed that visuals, or pictures, could be categorized according to their purpose or function within instruction—realistic, logical, or analogical. Realistic pictures look like the objects they refer to in the real world outside of the instruction. If the intention is to communicate a concrete example of the concept being presented, then a realistic picture is a good option for doing so. Logical pictures, on the other hand, provide a visual depiction of the structure of a concept being presented. If the purpose is to communicate an understanding of the organization of territories within a country or how electricity flows through a circuit, then a logical picture such as a map or diagram would be effective. Finally, an analogical picture depicts relationships among complex concepts through the use of concrete visual elements that are more familiar to the person. When there is a need to compare a particular phenomenon to something a learner is more likely to encounter in everyday life, then an analogical picture is a helpful option for communicating that information.

Using Visual or Graphic Elements to Increase the Effectiveness of Instruction

Taking into consideration the role of visual messages in the process of communicating information, it is important to think about ways in which visual and graphic elements can be used to increase the effectiveness of instructional materials. Peeck (1993) has suggested that the effectiveness of pictures within instruction is dependent upon the

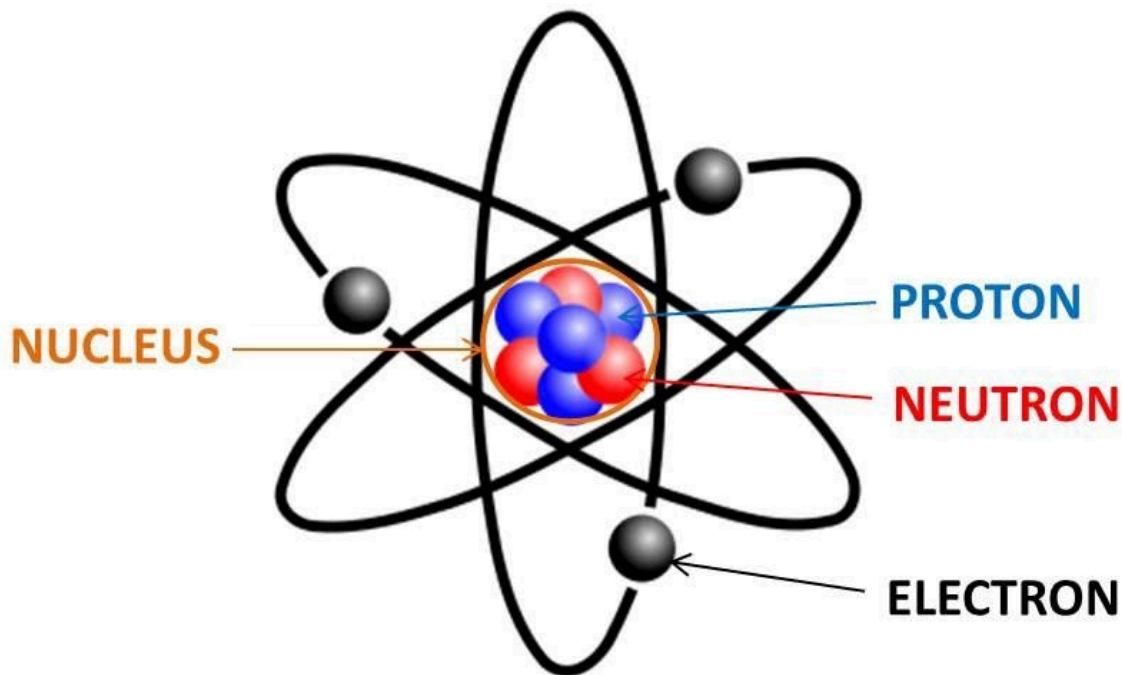
manner in which they cause the learner to process the information contained within the visual elements provided. This, in turn, is a product of both the characteristics of the learners themselves and the graphic materials used within the design. For example, visual elements can be a powerful means of showing spatial relationships or positioning of objects that are being presented within the instruction. These types of visuals can be placed before a section of text when learners are expected to draw upon prior knowledge of the information. They may also be placed in-line with the text when learners are unfamiliar with the spatial relationships and will benefit from a picture that shows relative positioning of the objects being discussed. Depending on the complexity of the material relative to the expertise level of the learner, pictures may also serve to illustrate abstract concepts that are presented textually within the instruction. Learners can use these visual elements to supplement their comprehension of the material through these representations or confirm their understanding of the text by reviewing the graphics and pictures provided. Yet another element of effectively using visual and graphic elements within instruction is the potential to motivate learners to pay particular attention to specific material and process information from the text more deeply. A learner may prefer to clarify or reinforce their understanding of textual information through visual elements, which can in turn help with the encoding and subsequent retrieval of that information at a later time.

Types of Visual Elements and Their Functions Within Instruction

While pictures and other visual elements can be extremely effective for learner motivation and comprehension, specific types of visual elements are more effective than others based on their function relative to the ways in which they relate to the instruction. Levin et al. (1987) categorize pictures into five general types according to those functions- representation, organization, interpretation, transformation, and decoration. One of the most common types of pictures used in instruction is representational, which illustrates the textual information being presented for the purpose of reinforcement (see Figure 1). When the purpose of using a picture is to present a concrete visual representation of information contained in the instruction, a representational picture is often the way to go.

Figure 1

A Representational Picture Illustrating the Components of an Atom

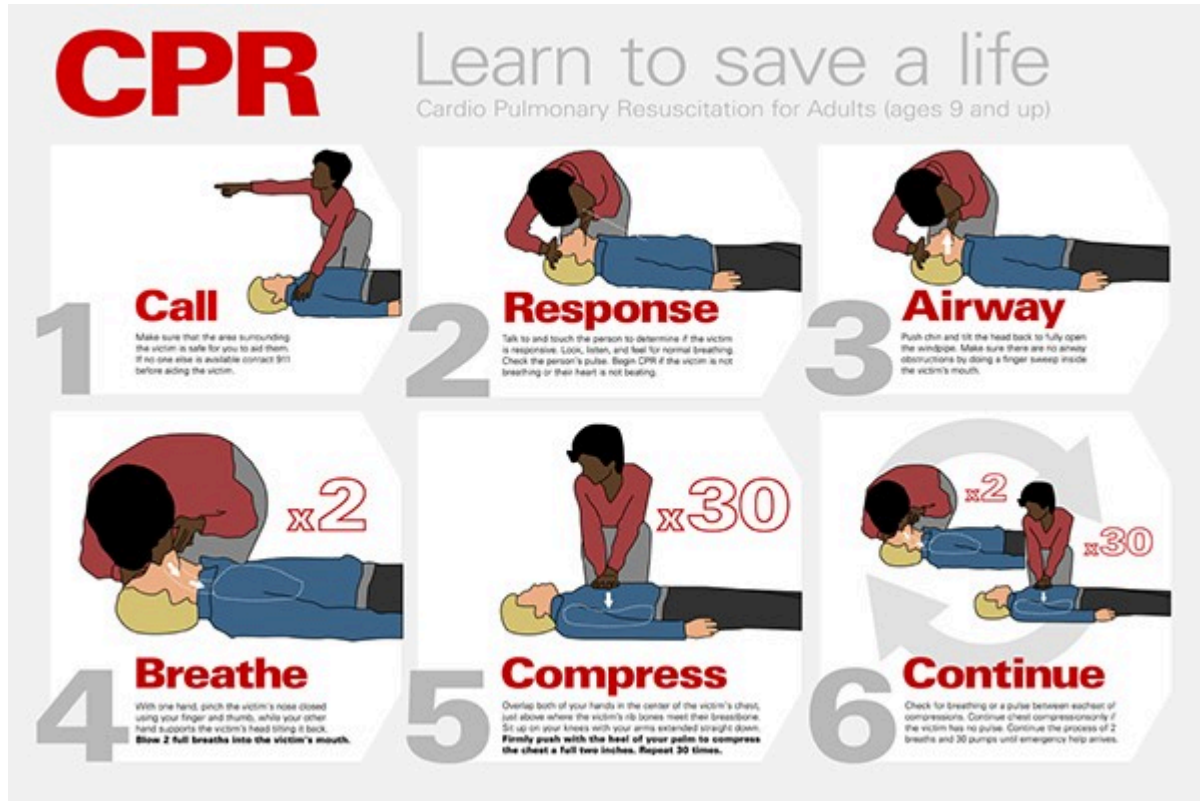


Note. Retrieved from <http://www.whoinventedfirst.com/who-discovered-the-atom/>

Another type of visual element is organizational, which shows relationships between different parts presented in the text (see Figure 2). These can serve the purpose of illustrating a series of steps in a procedure or provide a large set of data through graphics such as diagrams or charts.

Figure 2

An Organizational Picture Illustrating the Steps for Performing CPR

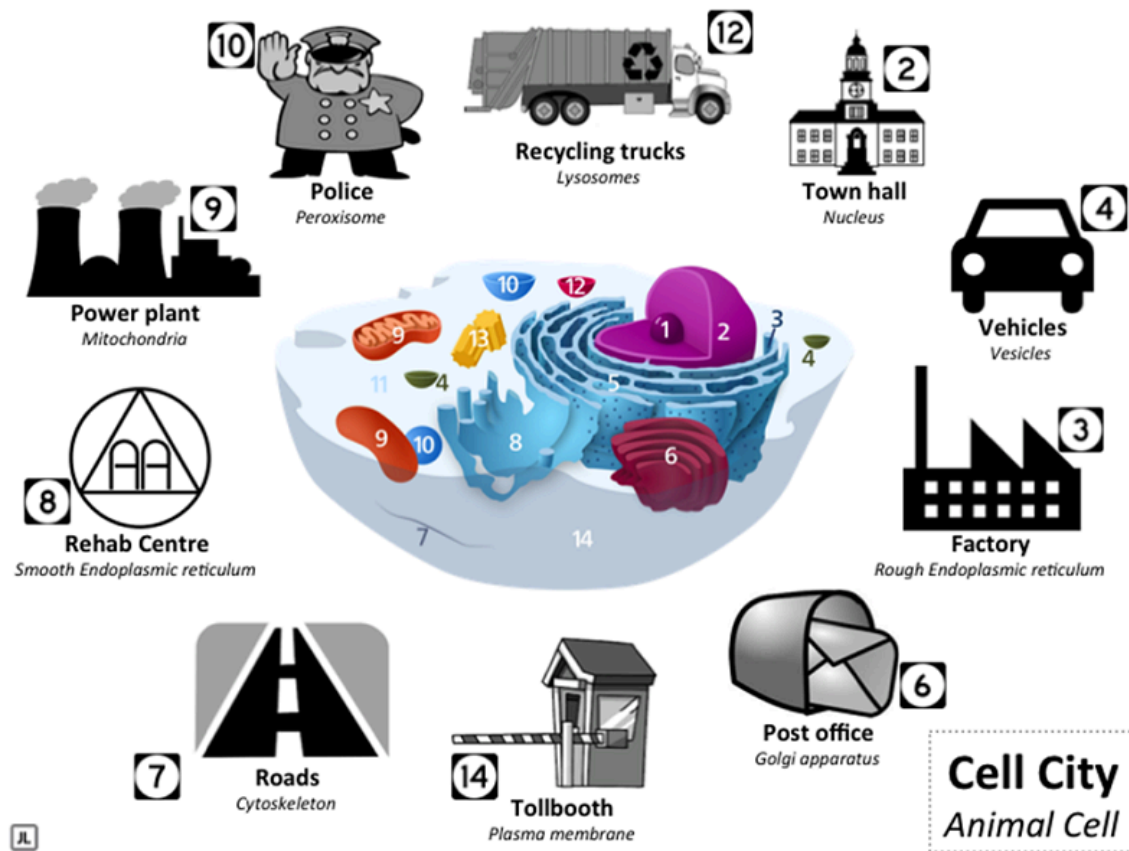


Note. Retrieved from <https://www.behance.net/gallery/3164136/CPR-Chart-Re-design>

An interpretational picture is a third type of visual element that is often used when the intent is to clarify complex information provided within the text (see Figure 3). Much like Knowlton's (1966) idea of analogical pictures, these visual analogies can be used to ground more abstract concepts in visual elements that are easier for the learner to comprehend.

Figure 3

An Interpretational Picture Presenting the Structures in an Animal Cell as Buildings in a City



Note. Retrieved from https://www.up.ac.za/teaching-and-learning/news/post_2679382-young-lecturer-use-analogies-to-assist-students-in-molecular-and-cellular-biology

Yet another type of graphic element that is somewhat infrequently used is the transformational picture, which provides a mnemonic that facilitates retrieval of information from memory at a later time (see Figure 4). If the intent of the visual element is to help the learner memorize information through the association of a related picture, then the creation of a transformational picture may be worth the time and effort to design.

Figure 4

A Transformational Picture Using Mnemonics for the Actions of Neurotransmitters

A

Serotonin
"Sir Rotten"

He is always in a
rotten mood



B

Acetylcholine - allow you to
contract your muscle



C



Dopamine

High doses - associated with
schizophrenia

Tall Dopey is "skiing"
"ski-zophrenia"

D

Dopamine
Low doses - associated with Parkinson's disease
Small Dopey is parking a car



Note. Retrieved from shorturl.at/hluJ7

A final type of visual element that is used within instruction but has no empirical support for its impact on learning is the decorative picture, which serves to break up textual information or provide "eye candy" for the learner (see Figure 5). While it is sometimes argued that decorative images may motivate learners, their use is not directly tied to improved learning outcomes and are thus generally discouraged.

Figure 5

A Decorative Picture of a Mountain



Note. ["Mountain"](#) by barnyz is licensed under CC BY-NC-ND 2.0

Strategies for Structuring Visual or Graphic Elements to Facilitate Processing

We can see that visual and graphic elements have the potential to increase the effectiveness of instruction, and specific types of visual elements are more appropriate based on their intended function within the instruction. However, it is also important to note that the manner in which visual and graphic elements are structured have a significant impact on the manner in which they are processed by learners. Sweller et al. (2019) describe cognitive load as the mental effort required by learning tasks that impact the learner's ability to both process new information and store it within long-term memory. They propose a set of strategies for structuring visual and graphic information to help manage the intrinsic load associated with the material itself and the extraneous cognitive load that is introduced by the instructional techniques employed:

- Integrate textual and graphic information into one element in order to eliminate the effect of splitting the learner's attention. This could be accomplished by taking a list of procedural steps and overlaying them on a diagram to show where each step should be performed.
- Eliminate multiple stand-alone sources of textual and graphical information in order to reduce the mental effort needed to deal with redundant information. If a visual or graphic element can fully communicate a concept without additional textual information, then it should be used on its own.
- Present concepts before adding context by giving the learner increasingly realistic visual elements during the instruction. By starting with low-fidelity visual elements and building toward high-fidelity elements, the learner is able to gain an understanding of the concepts rather than being distracted by contextual details.
- Gradually present information to learners through visual and graphic elements. Through the use of this simple-to-complex strategy, the learner will be able to avoid getting overloaded by too much information before processing the required information.
- Strategies to reduce cognitive load tend to have a reverse effect on learners with greater levels of expertise, and thus need to be adjusted accordingly. An example of this would be if the instruction will be used with expert learners who are familiar with a procedural diagram, the textual instructions could be removed from the graphic element and replaced with numbers for each step.

Finding and Creating Visual and Graphic Elements

Locating or creating visual and graphic elements to enhance instructional activities according to the principles discussed in this chapter may seem like a daunting task, but there are a number of resources available to make the process manageable. If you would like to find visual elements that have already been created by someone else, a number of sites online have collections of images that can be used without having to pay for their use. A few of these sites include:

- [Creative Commons image search](#)
- [Unsplash](#)
- [Pixabay](#)
- [StockSnap.io](#)
- [Pexels](#)

In addition to these individual sites, you can also use the Google Image Search in order to identify visual elements that have usage rights allowing you to employ them in your instruction without infringing on the copyrights of the owner. Watch this video to learn how this is done:

Google Image Search and the Usage Rights Filter Tutorial

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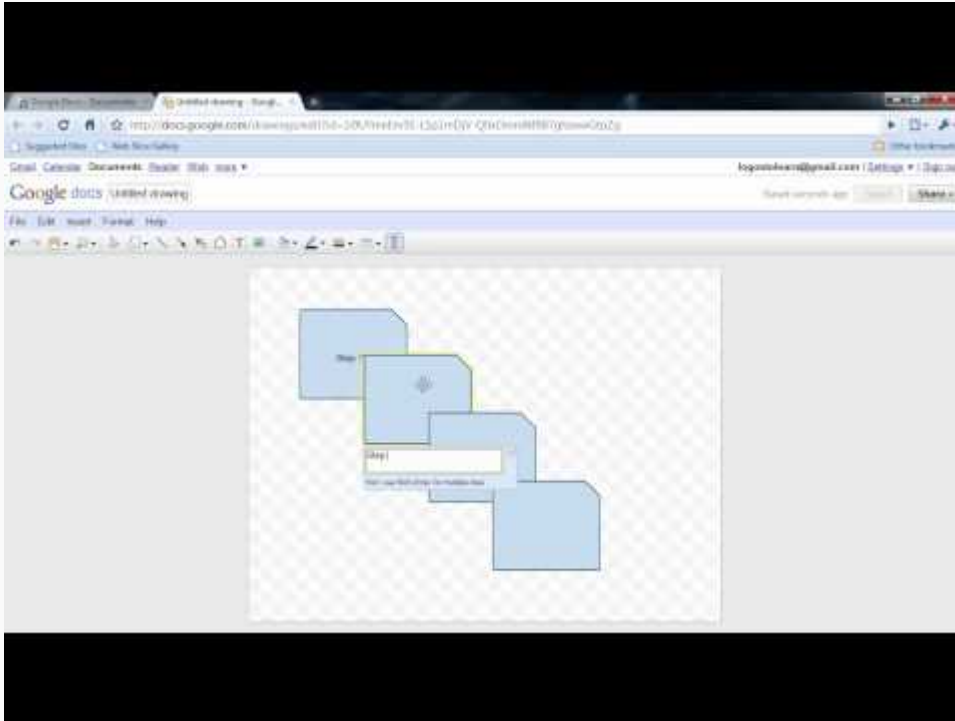
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If you are unable to locate existing visual or graphic elements for use in your instruction or have specific requirements in mind, you can always create them yourself in a number of different ways. First, you can take photos with a smartphone or digital camera and download these onto your computer for incorporation into your materials. Second, you could create the visual element by hand with a line drawing that communicates the desired information and scan that image into your computer using a digital scanner or printer. Finally, you can create visual elements in software packages such as Adobe Photoshop or through the SmartArt feature in Microsoft Word or PowerPoint and export them for use in your instruction. Google Drawings is a free, web-based alternative to these types of software that can be used to create charts, maps, or diagrams and download them as PNG or JPEG files without a great deal of design experience. Watch this video to see the basic use of this tool:

Introduction to Google Drawing



[Watch on YouTube](#)

Conclusion

Employing the use of visual and graphic elements during the instructional design process is not simply a matter of finding or creating a set of pictures that are somehow related to the textual information in the instruction. Research has shown that visual elements have the potential to increase motivation and foster improved learning outcomes, but only when the appropriate role of visual messages in the communication of information is taken into account. Specific types of visual elements can be used to serve a particular function in the instruction based on the manner in which information is presented, such as showing spatial relationships or illustrating abstract concepts within the text. In addition, following basic strategies for structuring visual and graphic information can facilitate learner processing through the management or elimination of the cognitive load experienced by the learner. In the end, the creation and curation of visual/graphic elements for instructional activities will be well worth the time and effort invested when the purpose of using those elements is aligned with the objectives of the overall instruction.

Application Exercises

1. Using an existing unit of instruction or one that you are in the process of creating, explain how you would use visual or graphic elements to increase the effectiveness of the instruction by doing the following:
 1. Showing spatial relationships or the relative positioning of objects
 2. Illustrating abstract concepts that are presented in the text
 3. Motivating learners to pay particular attention to specific material in the text
2. Using pre-existing instruction or materials you have created, explain how visual elements are used (or could be used) to serve each of the following functions:
 1. Representation
 2. Organization
 3. Interpretation
 4. Transformation
3. Within a unit of instruction that employs visual and graphic elements, explain how at least three of the five strategies for structuring visual elements outlined in this chapter could be used to reduce cognitive load and facilitate processing for the learner.

Additional Readings and Resources

Check out these resources for additional information on the topic of using visual and graphic elements while designing instructional activities:

- [233 Tips on Graphics and Visual Design \[PDF eBook\]](#)
- [Instructional Design and Visual Design: The Pillars of Great eLearning](#)
- [10 Types of Visual Content You Should Use to Increase Learner Engagement](#)
- [Accessible U: Instructional Graphics](#)
- [Do Learners Understand Your Instructional Graphics? \[Podcast\]](#)

References

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