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# Designing Meaningful Visuals for eLearning

Learn how to source and design meaningful images and graphics for eLearning modules

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Research in the field of Multimedia Learning has long shown that **“people learn better from words and pictures than from words alone”** (Clark & Mayer, 2016; Mayer, 2021). Research has demonstrated that students who learn from diagrams score better on retention and transfer tests vs. those who read a text passage alone. However, not all visuals are equal. Education research has also shown that poorly chosen graphics do not have a neutral effect on the student’s ability to learn and can actually **depress** learning. (Clark & Mayer, 2016; Mayer, 2021). Adding visuals that are topically related but extraneous to the learning objective can depressed learning by distracting learner’s attention away from learning goals (Clark & Lyons, 2010).

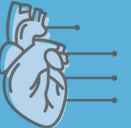
This guide will provide you with a decision tree and some reflective questions for thinking about **what content can be communicated visually** within an eLearning module, your lecture slides, or print educational materials. At the end of the guide, we’ve included a list of Public Domain and Creative Commons image libraries for sourcing photos and diagrams for the health sciences.

# The Functions of Graphics in Teaching

We can classify the function of all graphics in teaching materials into two broad categories:



**Decorative & Editorial Graphics**  
Do not teach any content. Added for aesthetic or emotional appeal.  
*e.g., cover art, editorial art*





**Instructional Graphics**  
Teach content that supports a learning objective of the course.  
*e.g., a diagram, infographic, flow chart, or photograph of an example*

(Clark & Lyons, 2010; Clark & Mayer, 2016)

Decorative graphics have a role in education materials, but excessive use of decorative graphics risks interfering with the process of learning. Best practices discourage their overuse (Clark & Lyons, 2010).

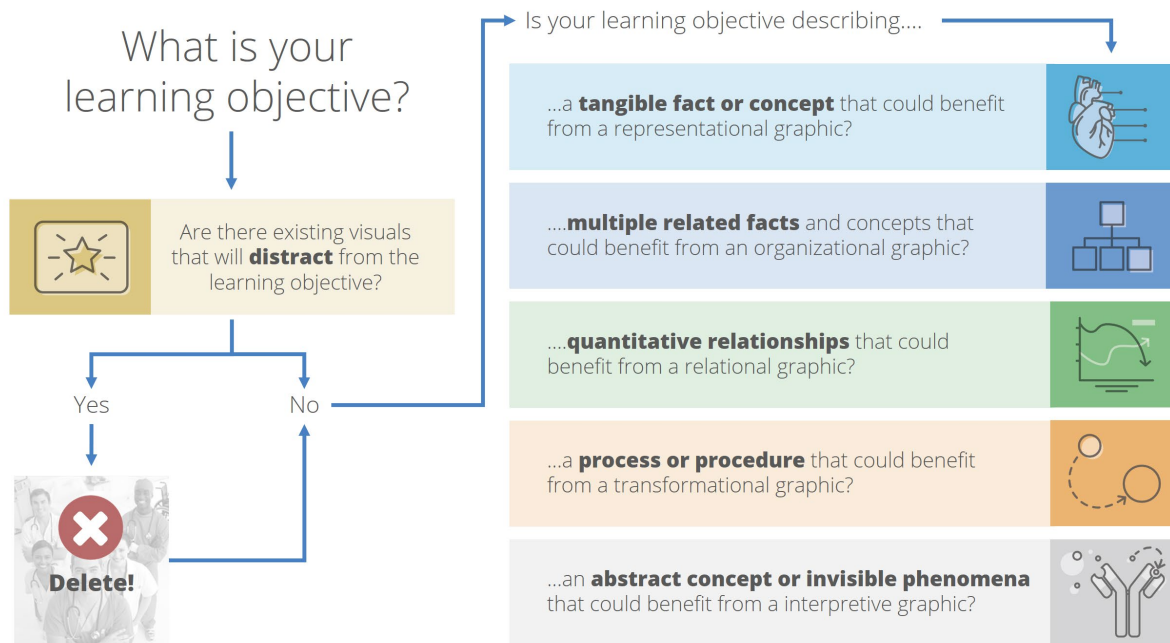
Multimedia researchers have further classified **Instructional Graphics** in five categories based on their specific function and what types of learning objectives that they support.

	<p><b>Representational</b> Appearance of something</p>		<p><b>Relational</b> Quantitative relationships</p>
	<p><b>Organizational</b> Qualitative relationships</p>		<p><b>Transformational</b> Changes over time and space</p>
		<p><b>Interpretive</b> Visualizes intangible phenomena</p>	

(Clark & Lyons, 2010; Clark & Mayer, 2016)

Keeping these categories in mind will help you analyze your lesson content for **WHAT CONTENT** can be communicated visually.

# Analyzing & Planning Instructional Graphics



Consider the following questions as you review your lesson content:

1. What is your learning objective?
2. Are there existing visuals that will distract from the learning objective?
3. Is your learning objective describing a **tangible fact or concept** that could benefit from a **representational graphic**?
  - a. Representational graphics can depict a **specific example** of a generalized fact/concept:
    - i. Visual Signs and Symptoms (Gross Anatomy, Tissue, Cells)
    - ii. Clinical Environment or equipment, tools, software screen capture
    - iii. "Concepts" can be shown visually with specific examples and non-examples (e.g., symptoms or safe use of equipment).
  - b. Representational graphics can depict a **simplified or generalized appearance** of something using illustration/line drawing:
    - i. Gross Anatomy, Tissue, Cells
    - ii. Clinical Environment or equipment, tools

4. Is your learning objective describing multiple related **facts** and **concepts** that could benefit from an **organizational graphic**?
  - a. What relationships between the facts/concepts are important in the lesson?
    - i. Hierarchy: Tree diagram
    - ii. Time: Flow chart
    - iii. Comparisons: Table (matrix)
    - iv. Can lesson topics or sub-topics be shown graphically in a lesson map?
5. Is your learning objective describing **quantitative relationships**/data that could benefit from a **relational graphic**? line graph, bar graph, pie chart, infographic etc.
6. Is your learning objective describing a **process (“how it works”)** or **procedure (“How to do it”)** that could benefit from a **transformational graphic**?
  - a. Photo/ illustration sequence of a clinical procedure.
  - b. Illustration sequence of physiological or pathological process?
  - c. Would the procedure benefit from an **organizational or interpretive graphic** (flow chart or decision tree)?
7. Is your learning objective describing an **abstract concept** or **invisible phenomena** that could benefit from an **interpretive graphic**?
  - a. Are there abstract relationships that could be shown graphically? (e.g., models of care? Decision trees?)
  - b. Are you teaching an invisible cause and effect phenomena that could be shown as a schematic diagram? (e.g., molecular processes, electrical processes, mechanical processes? Patient pathway through the healthcare system?)

Adapted from (Clark, 2020; Clark & Lyons, 2010)

# Creative Commons & Public Domain Licensing

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Often, after you figure out what type of image would support your learning objective, you may not have resources to create a custom image, so Public Domain and Creative Commons licensed images can be a great alternative.

## Public Domain Images

The image creator has given up their copyright. Images licensed as Public Domain may be distributed, remixed, adapted, and built upon in any medium or format, with no conditions. Some creators who license their images as public domain ask that you credit the source as a courtesy. Its good practice to list the source of the image, even if public domain.

## Creative Commons Images

The original creator still retains copyright, but allows others to use their image under 1-4 conditions:

- **BY** - Credit must be given to the creator
- **NC** - Only noncommercial uses of the work are permitted (*e.g., cannot use it in a social media advertisement, but can use it on a course slide*)
- **ND** - No derivatives or adaptations of the work are permitted (*e.g., cannot crop or modify colours etc.*)
- **SA** - Adaptations must be shared under the same terms (*e.g., if you make modifications to the illustration or photo, your modifications are also licensed as creative commons*)

Here's a quick guide explaining how to properly attribute Creative Commons licensed images:

[https://wiki.creativecommons.org/wiki/best\\_practices\\_for\\_attribution](https://wiki.creativecommons.org/wiki/best_practices_for_attribution)

# Creative Commons & Public Domain Image Libraries

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## Open-i Biomedical Image Search Engine

<https://openi.nlm.nih.gov/>

Open-i is an image search engine designed by the US National Library of Medicine that searches through Open Access journal articles. I find it useful for finding example patient case images (i.e., clinical photos, imaging etc.) You have to double check the original article license for each image - the search engine occasionally will make a mistake and the image/article will not be Creative Commons licensed.

## National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) Media Library

<https://www.niddk.nih.gov/news/media-library>

The NIDDK Media Library is a searchable database of images produced by the NIDDK that are available copyright free to the public at no cost. Images must be credited in the image caption: *National Institute of Diabetes and Digestive and Kidney Diseases, National Institutes of Health.*

## National Cancer Institute (NCI) Visuals Online

<https://visualsonline.cancer.gov/>

NCI Visuals Online is a library of some public domain photos, pathology slides, clinical photos, and illustrations. Check the license of each image - some are copyrighted. The images that are copyrighted must be licensed from the illustrator, Terese Winslow, directly: [terese@teresewinslow.com](mailto:terese@teresewinslow.com)

## National Eye Institute Media Library

<https://medialibrary.nei.nih.gov/>

Images and videos related to eye health and vision research from the National Eye Institute (NEI). Licensed as Public Domain as U.S. Government Works

(<https://www.usa.gov/government-works>)

## National Institute of General Medical Sciences Image Library

<https://images.nigms.nih.gov/>

This is a searchable collection of scientific photos, illustrations, and videos. The images and videos in this gallery are licensed under Creative Commons Attribution Non-Commercial ShareAlike 3.0. This license lets you remix, tweak, and build upon this work non-commercially, as long as you credit and license your new creations under identical terms.

## **MedPix® (National Library of Medicine)**

<https://medpix.nlm.nih.gov/home>

MedPix® is a free open-access online database of medical imaging and teaching cases from the National Library of Medicine. Contact Dr. James Smirniotopoulos <[medpixman@gmail.com](mailto:medpixman@gmail.com)> to ask permission for publishing a particular image in a course. Always cite the image and case authors and MedPix® when using.

## **PDB-101: Molecule of the Month Image Download**

<https://pdb101.rcsb.org/motm/motm-image-download>

Biological molecules and virus illustrations by David S. Goodsell. *Molecule of the Month* illustrations are available under a [CC-BY-4.0 license](#). Attribution should be given to David S. Goodsell and the RCSB PDB.

## **The Noun Project**

<https://thenounproject.com/>

Icon library of Creative Commons Licensed Icons. Useful for designing “Organizational Graphics” or Infographics.

## **Open Stax - Anatomy and Physiology**

<https://openstax.org/details/books/anatomy-and-physiology>

This is a Creative Commons licensed textbook with many basic anatomy and physiology illustrations (*the quality of the diagrams varies a lot though, so use your judgment on whether the diagram is accurate and clear*) Licensed as Creative Commons Attribution License v4.0.

## **Cancer Research UK – via Wikimedia Commons**

[https://commons.wikimedia.org/wiki/Category:Images\\_from\\_Cancer\\_Research\\_UK](https://commons.wikimedia.org/wiki/Category:Images_from_Cancer_Research_UK)

An image library of very simple diagrams of various cancers and cancer surgeries. I always download the svg file and redo the labelling in Adobe Illustrator (or any other vector editing

program) to be consistent with what we want to teach and our module style. The original Cancer Research UK labeling is in patient-facing language.

Licensed as Creative Commons Attribution-Share Alike 4.0 International license – this means that any edits we make to the diagrams can also be re-used by anyone, i.e., you cannot copyright your modified version of the diagram.

### **Medical illustrations by Patrick Lynch – via Wikimedia Commons**

[https://commons.wikimedia.org/wiki/Category:Medical\\_illustrations\\_by\\_Patrick\\_Lynch](https://commons.wikimedia.org/wiki/Category:Medical_illustrations_by_Patrick_Lynch)

High quality brain, head and neck, and cardiology images by a professional medical illustrator. Illustrations by Patrick Lynch, generated for multimedia teaching projects by the Yale University School of Medicine, Center for Advanced Instructional Media, 1987-2000. Patrick J. Lynch, <http://patricklynch.net> Creative Commons Attribution 2.5 License 2006; no usage restrictions except please preserve creative credits: Patrick J. Lynch, medical illustrator; C. Carl Jaffe, MD, cardiologist. <https://creativecommons.org/licenses/by/2.5/>

### **SMART - Servier Medical ART**

<https://smart.servier.com/>

Image library of anatomy, cell biology, and medical equipment illustrations provided to the public by a pharmaceutical company. Servier Medical Art by Servier is licensed under a Creative Commons Attribution 3.0 Unported License

### **“Specimens” by Ed Uthman, Pathologist via Flickr**

<https://www.flickr.com/photos/euthman/albums/72057594114099781>

This is a Flickr Album from a pathologist in Texas. You can find histology slides and resected specimen images. He licenses all his photos as Creative Commons (CC-BY).

### **Public Health Image Library (PHIL)**

<https://phil.cdc.gov/default.aspx>

Public Domain image library from the CDC. The library includes the CDC's ubiquitous COVID virus illustration (<https://phil.cdc.gov/Details.aspx?pid=2871> )



## References & Further Readings

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- Clark, R. C. (2020). *Evidence-Based Training Methods, 3rd Edition: A Guide for Training Professionals*: American Society for Training & Development.
- Clark, R. C., & Lyons, C. (2010). *Graphics for Learning: Proven Guidelines for Planning, Designing, and Evaluating Visuals in Training Materials*: Wiley.
- Clark, R. C., & Mayer, R. E. (2016). Applying the Multimedia Principle *e-Learning and the Science of Instruction: Proven Guidelines for Consumers and Designers of Multimedia Learning* (4 ed., pp. 67-87): Wiley.
- Mayer, R. E. (2021). *Multimedia Learning 3rd Edition*: Cambridge University Press.