

Learn by Drawing (for Students)

Much of the information in course materials is visual in the form of illustrations, graphs, diagrams and so forth. Adding visuals to text can enhance learning. Generally, words and pictures together are more effective for learning than words alone. This is known as the multimedia learning principle (Mayer, 2014). For example, a written or verbal description of prenatal development can be more effective if accompanied by illustrations of the developing organism from zygote, to embryo, to fetus. However, drawings that are used for the sole purpose of adding “visual interest” can disrupt learning when you see no connection between the drawing and the verbal information (Mayer, 2014). For example, in a lecture on prenatal development, the instructor inserts several photos of infants. These “seductive details” may attract your attention but do nothing to enhance your understanding of prenatal development.

Combining text and visual information takes advantage of our capacity for dual coding, the ability to process verbal and visual information through separate channels (Paivio, 1986). The result of dual coding is that we are able to save the information in two formats and then have two different ways of retrieving the information from memory.

Drawing as a learning strategy. Learner-generated drawings can help you learn more deeply than other learning strategies (Fiorella & Mayer, 2015). Learning by drawing involves creating drawings that depict text-based subject matter such as a passage from an article or a lecture. As you read or listen to a lecture, you draw one or more illustrations related to the information.

How does drawing a picture support learning? Making an illustration involves several cognitive activities associated with meaningful learning. In order to create a coherent drawing, you translate verbal text into a physical representation. You first identify component parts to include in a drawing and then organize the parts into a meaningful spatial arrangement. This is a process of organizing and connecting new information with prior knowledge.

How to use drawing as a learning strategy.

- Research on learning by drawing has focused mainly on STEM fields (Science, Technology, Engineering and Math). Little research has been done outside of the sciences.
- The subject matter in STEM fields may be well suited to visual representation. For example, it makes sense to draw a representation of a physical system or process such as how a hurricane develops or the way that the human circulatory system works. In contrast, abstract concepts may have no physical counterpart and there would be little benefit in trying to draw concrete representations of them. The value of a drawing is in organizing a spatial arrangement of ideas and information.
- It is best to generate drawings rather than copy existing drawings. Copying a drawing is equivalent to verbatim notetaking and does little to support meaningful learning processes.
- However, you can benefit by starting with a partial drawing provided by your text or instructor. The purpose of a partial drawing is to give you a starting point for your own drawing and alleviate some of the mental complexity associated with the mechanics of drawing.
- Sometimes students need training and guidance in how to make effective drawings. A key point is that drawing can hinder learning when students devote too much time and effort to

the mechanics of drawing, leaving less working memory capacity to think about the concepts they are drawing. In other words, don't be overly concerned about producing a sophisticated drawing. The drawing is just a tool to help you learn the subject matter.

- When you are involved in explaining course material to yourself, it may be helpful to make drawings consistent with your explanations. Drawing has been shown to facilitate explaining. In a series of studies, students who created a drawing while explaining concepts to other students learned more than students who explained the material without making a drawing.
- Use drawings for self-testing and self-explaining. Two effective learning strategies are self-testing, in which you try to recall what they have learned, and self-explanation in which you try to explain and expand upon what you have learned (Dunlosky et al., 2013). Drawings can be used as the basis for both strategies. Identify a drawing from a previous lecture or from your notes. Then draw it from memory (without looking at the completed drawing), label the parts and explain the process depicted in the drawing.

References

Ainsworth, S. E., & Scheiter, K. (2021). Learning by drawing visual representations: Potential, purposes, and practical implications. *Current Directions in Psychological Science*, 30(1), 61–67. <https://doi.org/10.1177/0963721420979582>

Dunlosky, J., Rawson, K. A., Marsh, E. J., Nathan, M. J., & Willingham, D. T. (2013). Improving students' learning with effective learning techniques: Promising directions from cognitive and educational psychology. *Psychological Science In the Public Interest*, 14(1), 4–58. <https://doi.org/10.1177/1529100612453266>

Fiorella, L. & Mayer, R.E. (2015). *Learning as generative activity: Eight learning strategies that promote understanding*. NY: Cambridge University Press.

Fiorella, L., & Kuhlmann, S. (2020). Creating drawings enhances learning by teaching. *Journal of Educational Psychology*, 112(4), 811–822. <https://doi.org/10.1037/edu0000392>

Mayer, R.E. (2019). How multimedia can improve learning and instruction. In J. Dunlosky & K. A. Rawson (Eds.) *The Cambridge handbook of cognition and education* (pp. 460-479). NY: Cambridge University Press.

Mayer, R.E. (2014). Introduction to multimedia learning. In R.E. Mayer (Ed.). *The Cambridge handbook of multimedia learning* (2nd ed. pp. 1-24). NY: Cambridge University Press.

Paivio, A. (1986). *Mental representations. A dual coding approach*. NY: Oxford University Press.