Learn by Drawing

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 student learning when students 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 students' attention but do nothing to enhance their 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.

Diagrams and drawings are used in course materials in several ways:

1. Instructors combine written or oral material with illustrations. Curricular materials commonly incorporate illustrations, charts, drawings, graphs, along with verbal text.

2. Illustrations are objects of learning. Students are expected to replicate, label, and explain illustrations that have appeared in lectures and course material.

3. Illustrations are used for practice testing and elaboration. Two effective learning strategies are practice testing, in which students try to recall what they have learned, and elaboration in which students try to explain and expand upon what they have learned (Dunlosky et al., 2013). Drawings can be used as the basis for both strategies.

- For a practice quiz the instructor gives students a drawing from a previous lecture and asks them to label the parts and explain the process depicted in the drawing.
- For a practice quiz, the instructor gives students a written passage and asks them to produce a drawing that represents the concepts in the passage.

4. Learner-generated drawings are used to support learning. A growing area of research focuses on how learner-generated drawings can help students learn more deeply than other learning strategies (Fiorella & Mayer, 2015). Learning by drawing involves students in creating drawings that depict text-based subject matter such as a passage from an article or a lecture. As students read or listen to a lecture, they 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 a student must translate verbal text into a physical representation. Students first identify component parts to include in a drawing. Drawing then involves organizing the parts into a meaning spatial arrangement that

maps onto the text description. 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. Little research has been done outside these disciplines.
- 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.
- Students should generate drawings rather than copy existing drawings. Copying a drawing is equivalent to verbatim notetaking and does little to support meaningful learning processes.
- However, students can benefit by using a partial drawing provided by the instructor. The purpose of a partial drawing is to give students a starting point for their own drawing and alleviate some of the cognitive load associated with the mechanics of drawing.
- Students may need training and guidance in how to make effective drawings. Research has shown 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.
- Drawing has been shown to facilitate explaining (Fiorella & Kuhlmann, 2019). 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. When students are involved in explaining course material to one another, instructors might ask them to generate drawings consistent with their explanations.
- Instructors who use drawings in their own work to learn and teach disciplinary concepts might consider sharing their strategies with students. Instructors could use these opportunities to promote drawing as a technique to better understand and retain course material.

References

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