

Ten Ways to Use Your Hands in Teaching Biology

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Over 80% of all learning is accomplished through use of the eyes. Though hearing is an important adjunct to the learning process, it accounts for only about 10%. It is obvious to educators, therefore, that visual aids are an integral part of the instructional process. These visual aids need not always be made or purchased, but can be any device at hand. Perhaps more out of desperation than design, I resort to using my hands as visual aids to explain various biological concepts. Have your students make the hand manipulations to ensure that they understand the concepts.

The following are ten examples:

Lipid Molecule Structure. The vertical index finger represents the single glycerol molecule, and the three fingers of the opposite hand represent the three attached fatty acids (fig. 1).

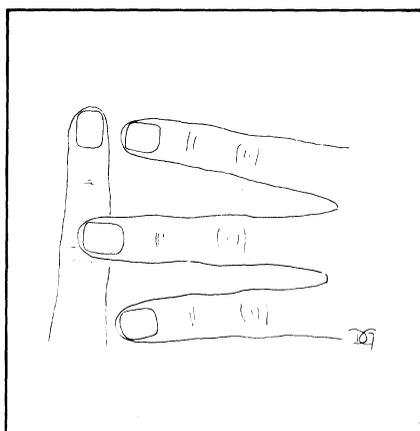


FIGURE 1. Lipid molecule structure

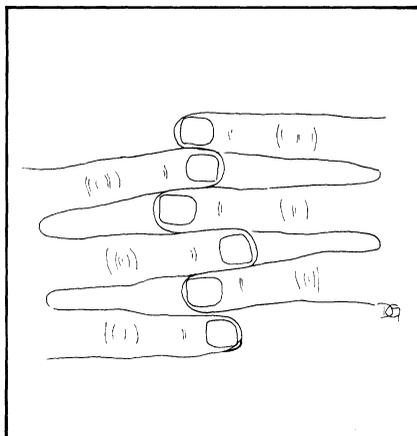


FIGURE 2. Muscle expansion and contraction

Muscle Expansion and Contraction. The three fingers of the left hand represent the actin molecule and the three of the right hand, the myosin. The dove-tail design aids in explaining how the molecules interact as a muscle moves (fig. 2).

Stagnant Venous Blood and Its Drainage. When the arms are held at the sides for several moments, the venous blood collects in the veins on top of the hand. When the arms are then raised above the head, the veins flatten as gravity aids in returning venous blood to the heart (fig. 3).

Chemical Composition of the Plasma Membrane. By extending the four fingers as illustrated, the four layers of the cell membrane can be demonstrated. From top to bottom, the layers are: protein, lipid, lipid, protein (fig. 4).

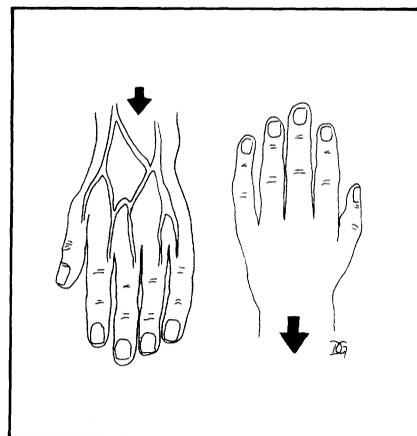


FIGURE 3. Stagnant venous blood and its drainage

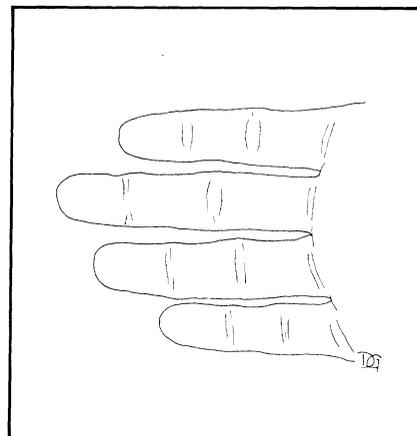


FIGURE 4. Chemical composition of the plasma membrane

Apical Stem or Root Growth. If the pinky finger was a branch, it would be three years old. Next year it would add another joint at its apex, thus making it four years old (fig. 5).

Resolution. Resolution, the ability to distinguish between two objects,

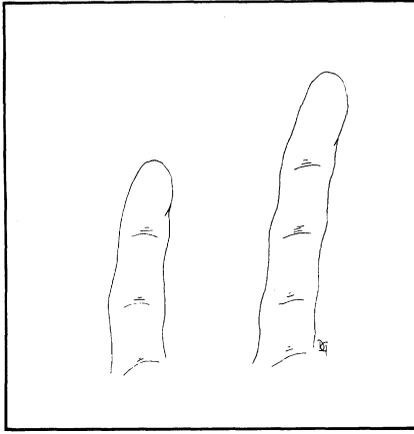


FIGURE 5. Apical stem or root growth

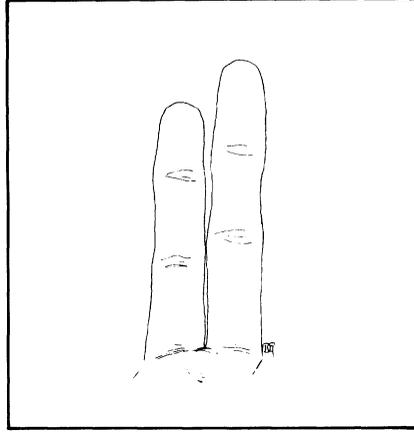


FIGURE 6. Resolution

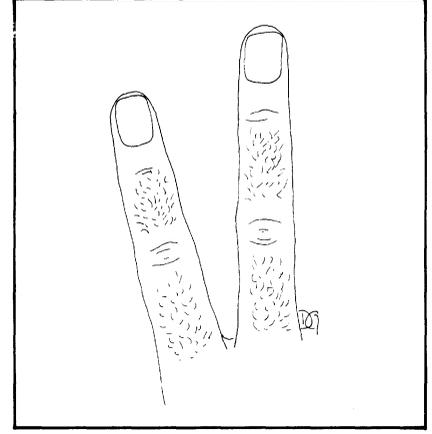


FIGURE 7. Mid-digital hair

is easily demonstrated by holding up two fingers as shown (fig. 6).

Mid-digital Hair. Presence of hair on the middle joint of the fingers is a dominant genetic trait, while its absence is a recessive trait (fig. 7).

Hitch-hiker's Thumb. The ability to bend the thumb joint back is a recessive genetic trait, while a straight thumb is a dominant trait (fig. 8).

Bent Pinky. The ability to bend the

last pinky joint inward toward the index finger is an example of a dominant genetic trait, while the inability to do so is a recessive trait (fig. 9).

Opposable Thumb. The thumb is the only digit that can touch the faces of the other four digits. This ability gives man a dextrous precision grip and allows extensive digital maneuvers (fig. 10).

These are only a few ways that

instructors can use their hands to communicate biological concepts. No doubt the reader is reminded of several that he or she already uses and others that could be developed. Seeing is believing.

Acknowledgment—My thanks to my student, David Gurfein, who did the excellent art work.

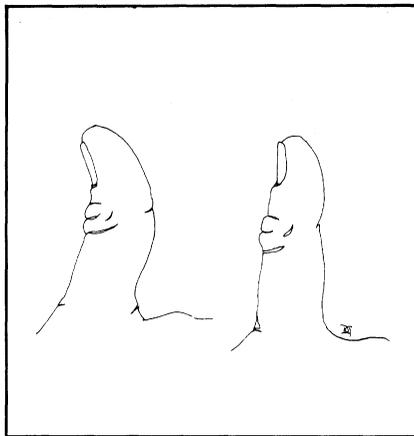


FIGURE 8. Hitch-hiker's thumb

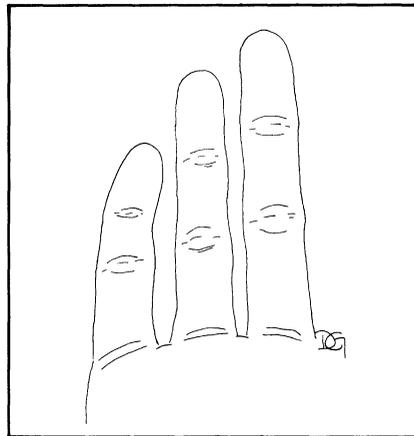


FIGURE 9. Bent pinky

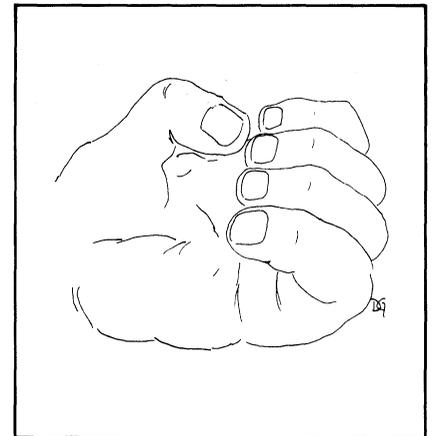


FIGURE 10. Opposable thumb