Finding and Using the ART in Science Lessons

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EXECUTIVE SUMMARY

Teachers can find art in their science lessons if they know what to look for. The art in many science lessons is in the form of visual representations, which can be seen to exist on a continuum ranging from very concrete and iconic to very abstract and symbolic. There should be a progression through a lesson that guides students in identifying, interpreting, and analyzing different visual representations, and ultimately help them know how to create their own. The teacher should be very deliberate in his/her selection, generation, and/or use of visual representations. Five critical things the teacher should be mindful of include: (1) how the learner's mind processes visual information, (2) what visual literacy is, (3) what is meant by cognitive loading, (4) different types of visual representations, and (5) augmenting student learning by using a variety of visual encryptions.

LITERATURE REVIEW

Incorporating art within science lessons may at first seem daunting to teachers, but many elements of art can be easily utilized and are, in fact, often already present in lessons if one knows what to look for. For example, it is a very common practice in middle grade life science classes to have students draw what they see when observing cells through a microscope. The inclusion of that act of drawing is the incorporation of art within the science lesson. A key consideration by teachers at this juncture is what to do with those drawings. Most of the time, the drawings are

relegated to being just a part of a laboratory report, and little more is said about or done with them. This is unfortunate. With some further consideration, the teacher could make use of those drawings to more accurately assess what their students are conceptually gleaning from their microscopy work, and could use those drawings as springboards to help students develop their concepts about cells more efficiently and more thoroughly. The drawings can become tools useful in the teaching and learning of science conceptual information. In short, the art can facilitate science learning.

The importance of art in the form of visual data in science education is underscored by an increasing number of references to it in standards such as the Next Generation Science Standards (National Research Council, 2012). Among the practices elucidated in the standards are some directly calling for conceptualization through visualization of data, interpreting and analyzing it, generating it, and communicating with it. In these ways, the NGSS framework provides direction to science educators about what should be included in instruction. Yet educators must know why those art-related things should be included and how their use affects students' cognitive development, including why a certain visual representation should be utilized in one context but not another or why visual representations should be sequenced in a particular order.

For teachers to capitalize on the power of art in their science lessons in ways that address NGSS standards, they should understand how some essential and critical aspects of art fit together. These aspects include . . .

- How the learner's mind processes visual information,
- What visual literacy is,
- What is meant by cognitive loading,
- Different types of visual representations, and
- Augmenting student learning by using a variety of visual representations.

Mental Processing of Visual Information

A good beginning point is to understand a basic tenet derived from a cognitive psychological perspective on human brain function. Without going into too much depth, the essential point is that the human brain is hardwired to process images such as drawings, pictures, and photographs much more readily and efficiently than it is to process more abstract and symbolic images such as alphanumeric text. For example, it is much easier for learners to quickly grasp the idea of how to set up a laboratory apparatus (such as a stream table in an earth science lab setting) by looking at a diagram or picture of it as compared to reading a paragraph of text describing it and explaining how to set it up. When given a choice, students tend to prefer working with images rather than reading text. Brumberger (2010) studied