

The reason why “students can graduate from university with a science-related major and still not understand fundamental concepts” is that, in the way science is usually taught, the fundamental concepts are getting overshadowed by the details. According to the article,

A crucial decision teachers must make is the “take-home message”—the big idea—that students should learn. This is the central concept that should last long after experiences and facts have faded from memory.

I think teachers favor experience and facts because the big concepts are really abstract. We obviously can’t just teach the concept the way its worded in the standards and then call it a day.

We want to give students concrete examples, but we end up missing the forest for the trees. We want to make it understandable for the students, so we focus on easy digestible chunks. These are easy to teach and test. Maybe we think the tangible details, like labeling the parts or identifying stages will be enough for students to understand the concept but we are wrong. Unless we give them the language of the big concepts, they won’t know what is most important– the big universal truths.

My co-teacher in the garden teaches the stages of the butterfly every year. She uses a worksheet where the kids cut out a picture of each stage and glue them together in order. It’s not totally clear what this activity even has to do with the garden. The butterflies pollinate many of the plants but other insects do this as well so a better approach would be to teach butterfly life cycle as an element of LS1B “Plants and animals have unique and diverse life cycles.” To get students to see the big idea of structure and function, the article suggests learning about parts of various organisms, roots, stems, flowers, wings, beaks, claws, eggs, fur

in order to see that all living things depend on the structure of the parts to grow and reproduce. In terms of the lifecycle, a butterfly has a life cycle because all living things have life cycles so students can learn about many different lifecycles. They can also learn through inquiry and observation of the different stages in insects in the garden – finding insect seeds, and caterpillars, watching cocoons and noting changes. It takes more planning and time than cutting out a worksheet. Olson suggests

Many days and even weeks of work are often required to get students focused on the central concept, including activities, discussions, collaborative work to make sense of data, teacher-introduced information, consolidation experiences, and application activities.

For me this is one of the really big take-aways of the class. The article really changed my thinking and has helped me identify a major blind spot in the way I have been teaching. Most of my science teaching has been in the school garden where it's so easy to get distracted by the details – what individual plants are doing. The sensory input is mesmerizing and crucial for developing a hands-on, physical experience with life science. But now I see that the big concepts are just as important.