

## **ADDITIONAL TEACHING SUGGESTIONS** for the CHECKS LAB and Other Nature of Science Lessons.

Be sure to review the Synopsis, Concepts, and Teaching Strategies, especially the **Extensions and Variations** suggested in the **Checks Lab**. “**The Great Fossil Find**” lesson mentioned is fun and fairly easy, and probably a more obvious simulation of real science.

Although you can certainly ask students to point out the elements of “The Scientific Method” which they are using in their development of a probable scenario suggested by the checks, I would make an even stronger point that they are not actually doing lab experiments to **test their hypotheses** (the usual criterion most people assume to be science), but rather testing their ideas by looking for **patterns of information** in the checks in hand which are consistent with those ideas, thereby building a plausible, hopefully probable, story line which fits all the evidence. This is how forensic scientists (CSI, etc.) try to figure out how a crime was perpetrated, and who did it, something nobody living observed (or would confess to), can’t really be repeated, and must be based solely on evidence found. This is also how scientists do much of their work in paleontology, astronomy, geology, and evolutionary biology, the “historical” sciences! Point out that there really is **no ONE scientific method**, but rather different METHODS, all designed to figure out the most accurate explanation which fits all the evidence. If you can get a copy of *The American Biology Teacher* (NABT journal) for August 2002, see the article on pages 427-432, by Robert Cooper: “Confronting Myths About Evolution and Scientific Methods,” where this is ably discussed at length.

As for which scenario is “correct” or “best”, emphasize that in science, **we never KNOW**. Scientists use discriminating criteria to reach the “best” explanation for the moment, based on (and consistent with) existing data (evidence), and this may always be modified with new evidence; be sure to click to the “**Fair Tests**” link in item #1 under Extensions and Variations. Our experience is that, even though **never proven** (final), scientific findings tend to give us useful and reliable insights which have led to greater health, comfort, success, and the peace of mind that comes with **understanding** how our world works.

The Checks Lab is also an excellent way for students to experience the very real fact that even in science, cultural **biases** and experiences DO influence interpretations (and even perceptions). Be sure to discuss this a bit, and BE SURE to start doing the “**False Assumptions**” lesson to further clarify how our common assumptions and “common sense” affect our judgments. Those False Assumptions sheets (display on overhead, without revealing the answers) make nice closing activities when you have a little extra time before the bell rings, and it’s teaching them some important concepts, too.

And finally, point out the **social** aspect of their efforts, just as in real science. Scientists typically collaborate, share ideas through conventions, meetings, and publications, much as they were doing as they discussed the checks.

These are all the things most people fail to recognize as typical of science, so anytime you can do something to point them out (or even better, get THEM to point out), you will have clearly improved their **science literacy**.

Another fun thing you might want to bring in at some point is **illusions**. Science is often NOT just observation, or even common sense; perception is NOT always reality! Doesn’t the earth seem flat outside? Doesn’t the Sun seem to move across the sky? Don’t species seem to stay the same, forever? Take a look at our page on illusions <<http://www.indiana.edu/~ensiweb/lessons/unt.illu.html>> .

Finally, something else seldom brought out for science students is that science is **not democratic**, and it’s not supposed to be fair. Whatever reality is, it IS, and in science, we are merely trying to find out what that reality is, consistent with observations, and trying to understand it. Our conclusions are not based on feelings, popularity, or logic, or certainly not what is currently politically correct! That’s one reason why debate or voting are never appropriate means for getting answers in science. Presenting different scenarios, stories, “theories” or “hypotheses” in class, and letting students decide which one they think is best, is decidedly unscientific, especially if they are not given any objective criteria to apply to the selection process.