

## **5th Grade Astronomy Unit Student Misconceptions**

### **Misconception about the Nature of Science and Scientific Inquiry (AAAS, 1993, p. 33)**

Some students of all ages believe science mainly invents things or solves practical problems rather than exploring and understanding the world.

### **Misconceptions about the Shape of the Earth (AAAS, 1993, p. 335)**

Student ideas about the shape of the earth are closely related to their ideas about gravity and the direction of "down" (Nussbaum, 1985a; Vosniadou, 1991). Students cannot accept that gravity is center-directed if they do not know the earth is spherical. Nor can they believe in a spherical earth without some knowledge of gravity to account for why people on the "bottom" do not fall off. Students are likely to say many things that sound right even though their ideas may be very far off base. For example, they may say that the earth is spherical, but believe that people live on a flat place on top or inside of it—or believe that the round earth is "up there" like other planets, while people live down here (Sneider & Pulos, 1983; Vosniadou, 1991). Research suggests teaching the concepts of spherical earth, space, and gravity in close connection to each other (Vosniadou, 1991). Some research indicates that students can understand basic concepts of the shape of the earth and gravity by 5th grade if the students' ideas are directly discussed and corrected in the classroom (Nussbaum, 1985a).

### **Misconceptions about Astronomical Phenomena (AAAS, 1993, p. 335)**

Explanations of the day-night cycle, the phases of the moon, and the seasons are very challenging for students. To understand these phenomena, students should first master the idea of a spherical earth, itself a challenging task (Vosniadou, 1991). Similarly, students must understand the concept of "light reflection" and how the moon gets its light from the sun before they can understand the phases of the moon. Finally, students may not be able to understand explanations of any of these phenomena before they reasonably understand the relative size, motion, and distance of the sun, moon, and the earth (Sadler, 1987; Vosniadou, 1991).

### **Misconceptions about Light (AAAS, 1993, pp. 338-339)**

The majority of elementary students and some middle-school students who have not received any systematic instruction about light tend to identify light with its source (e.g., light is in the bulb) or its effects (e.g., patch of light). They do not have a notion of light as something that travels from one place to another. As a result, these students have

difficulties explaining the direction and formation of shadows, and the reflection of light by objects. For example, some students simply note the similarity of shape between the object and the shadow or say that the object hides the light. Middle-school students often accept that mirrors reflect light but, at least in some situations, reject the idea that ordinary objects reflect light (Guesne, 1985; Ramadas & Driver, 1989). Many elementary- and middle-school students do not believe that their eyes receive light when they look at an object. Students' conceptions of vision vary from the notion that light fills space ("the room is full of light") and the eye "sees" without anything linking it to the object to the idea that light illuminates surfaces that we can see by the action of our eyes on them (Guesne, 1985). The conception that the eye sees without anything linking it to the object persists after traditional instruction in optics (Guesne, 1985); however, some 5th-graders can understand seeing as "detecting" reflected light after specially designed instruction (Anderson & Smith, 1983).

### **Misconceptions about the Forces of Nature (AAAS, 1993, p. 340)**

The earth's gravity and gravitational forces in general form the bulk of research related to Forces of Nature. Elementary-school students typically do not understand gravity as a force. They see the phenomenon of a falling body as "natural" with no need for further explanation or they ascribe to it an internal effort of the object that is falling (Ogborn, 1985). If students do view weight as a force, they usually think it is the air that exerts this force (Ruggiero et al., 1985). Misconceptions about the causes of gravity persist after traditional high-school physics instruction (Brown & Clement, 1992) but can be overcome by specially designed instruction (Brown & Clement, 1992; Minstrell et al., 1992).

### **Source:**

American Association for the Advancement of Science (1993). *Benchmarks for science literacy*. New York: Oxford University Press.