Conceptual Interview Assignment: Interview Report

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Method

Two 8th grade students volunteered for this interview. Each student came in for a 15-minute one-on-one session with the instructor after class. Before each session, the instructor informed the student that this was simply a survey to learn more about how students learn science and the response would not affect the student’s grade. Following are the key exchanges.

Interview 1

Teacher: Okay, tell me about density.

Student 1: It’s how much something takes up.

Teacher: I see. If you look at two things, how would you know what the densities are?

Student 1: Maybe, measure.

Teacher: What would you measure?

Student 1: Its height.

Teacher: Anything else you’d measure?

Student 1: How big it is.

Teacher: So, the height and how big it is. Are they two different things? The height and how big something is?

Student 1: Not really. The height and length.

Teacher: Why do you think they might similar densities?

Student 1: Because they have about the same size.

Teacher: How about if you have a really big pillow and a small golf ball?

Student 1: The pillow would be bigger…. Pillow has more density?
Teacher: Do you remember what we learned about density in this class?

Student 1: There was a formula or definition... It was mass/volume.

Teacher: What is mass?

Student 1: How much space something takes up.

Teacher: What is volume?

Student 1: How big it is.

Teacher: Are mass and volume the same thing or are they different?

Student 1: Mass is more like weight kind of. Volume is just like how big is, the size.

Teacher: Anything else you remember about density?

Student 1: Not really... Oh, g/cm

Teacher: What is that?

Student 1: Mass/volume. How much mass it has divided by its volume.

The purpose was to assess the student’s conceptual understanding of density. Student 1 dutifully recalled the textbook definition of density and the formula. However, she failed to apply the knowledge with real objects. The distinction between density, mass, and volume is not clear. Both weight and volume seemed to depend on how big the object looked to the subject. There is a disconnect between what is learned in the classroom and what is already accepted as truth in the student’s mind.

Interview 2

Teacher: Okay, tell me about density.

Student 2: Density is how big something is.
Teacher: I see. If you look at two things, how would you know what the densities are?

Student 2: You weigh it.

Teacher: What would the weight tell you?

Student 2: How big something is.

Teacher: How do you know which one has more density?

Student 2: If it is bigger, it will be heavier, and it will be more dense.

Teacher: Why do you think they might have similar densities?

Student 2: Because they are both plastic.

Teacher: You are saying that if they are both made of plastic, they will have similar densities?

Student 2: Yes.

Teacher: How about if you have a really big pillow and a small golf ball?

Student 2: Pillow is bigger, but golf ball is heavier.

Teacher: Which one would have more density?

Student 2: I think the golf ball has more density because it will sink in water because it is heavy.

Teacher: What about the pillow? Would pillow float in water?

Student 2: I think so. Pillow is big, but it’s light. Like feather. I think it will float in water.

Teacher: I see. How does density relate to floating or not floating then?

Student 2: I’m not sure, but heavy things don’t float in water, they sink. If it’s light, it floats.
Student 2 similarly equated density to “how big something is” and missed to include both mass and volume for density. When asked to compare the density of two objects, he pointed out the mass and suggested weighing it. Despite the introduction to density in class, the student still seemed to hold onto the belief that the size and weight are the same. A large object must weigh heavy and therefore more dense.

Interestingly, the subject related density to buoyancy. To evaluate whether or not an object would float, the subject considered its material composition. If it is made out of plastic, it would be light and float. If it is made out of metal, it would be heavy and not float. Simply, lightness or heaviness of an object determined the buoyancy. Considering that the students have not yet learned about this topic, the response is average for students at this age.

The challenge in science education is in identifying the students’ prior knowledge and clarifying the misconceptions before instructing the concept. Reading the text or lecturing alone would not lead to student learning. Unless the students are given the opportunities to observe and to explore, they will not be able to destruct myths and learn. What mass, volume, and density are should be revisited, and the lessons should strategically address the misconceptions.