**Table 2.** Materials and instructions for water bottle demonstration.

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| Water Bottle Demonstration | |
| Materials | * Standard 20 oz. bottle with a small hole cut near the bottom (provide image) * A chair or other elevated surface to stand on * A large bucket (if done inside) * A gallon of water to fill your bottle * [Optional] A smart phone with the ability to capture slow motion |
| Instructions | This demonstration is done in two parts  PART 1 |
| 1. Plug the hole in the 20 oz. bottle with your index finger while filling the bottle with water until it is full. |
| 1. Place the bucket beneath you and extend your arms over the bucket. With your free hand hold the water bottle from the top. |
| 1. Next, stand on an elevated surface and describe what you are about to do for your students. Here is sample dialogue: *Alright everyone! I have filled this water bottle to the brim with water, but this bottle has a hole cut into the bottom. I am about to uncover this hole, which I am plugging with my finger. Everyone, I want you each to shout a prediction about what will happen when I unplug this hole.* |
| 1. Students will shout predictions, which you should anticipate will be accurate. Remove your finger while holding the bottle from the top. The water should simply “pour” out of the hole. Try to “pour” the water into your bucket to avoid a mess on your floor. |
| 1. Briefly discuss with students how their observations matched their predictions. |
| PART 2 |
| 1. Plug the hole in the 20 oz. bottle with your index finger while filling the bottle with water until it is full. |
| 1. Place the bucket beneath you and extend your arms over the bucket. With your free hand hold the water bottle from the top. |
| 1. Next, stand on an elevated surface and describe what you are about to do for your students. Here is sample dialogue: *Alright everyone! I have filled this water bottle to the brim with water, but this bottle has a hole cut into the bottom. I am about to uncover this hole which I am plugging with my finger. HOWEVER, this time I will also, at the same time, let go of the top of the bottle with my other hand. Everyone, I want you each to shout a prediction about what will happen now that I have made this change.*   At this time if you or a student has a device capable of taking slow motion footage it is a great option to have someone record you dropping the bottle. Ask for a student volunteer. |
| 1. Students will shout predictions. These will vary as I have heard students say that the water will pour up, pour faster, pour straight out, shoot out of the top of the bottle, etc. In the many times I have done this demonstration I have not heard a student make an accurate prediction.   This time no water will escape the bottle. Both the bottle and water inside accelerate toward the earth at the same rate. This simulates the weightlessness of the water relative to its vessel, the bottle. Do not make this explanation to your students at this time. |
| 1. After dropping the bottle, share the video (if you have it) with your students so they can better observe how no water escapes the bottle. Then lead a discussion about why this observation did not match any of their predictions. *In the case that a student may have predicted accurately, ask them to explain why the phenomenon occurs.* In any case, it is very unlikely that your students will completely understand why this occurred.   End this activity by telling your students that you will revisit this observation the next day! |
| Safety Concerns | 1. There is a good amount of water involved in this demonstration, so be prepared to dry your floors upon completing this activity with your students. This may be a great opportunity to have a custodian mop the floor immediately after, or bring a towel to make sure the floor is dry and no students slip and fall. 2. There is also a concern that if the bottle is dropped high enough that a student may become harmed by standing too close. Please ask your students to keep a safe distance. |