



Yana and Egbert and the Mystery Box

Game you can play at home

Equipment:

- 1) a small cardboard box or opaque plastic container with a lid
- 2) a collection of any of the following: a paper clip, a marble, a penny, a cotton ball, a pencil eraser, a cork, a button, a grape, etc.

How to play:

- 1) Pick any two objects out of the collection. (These are your competing hypotheses about what's in the box.)
- 2) Show your partner the two objects and then have her close her eyes.
- 3) Put one of the two objects in the box and put the other object behind your back or somewhere where your partner can't see it.
- 4) Let your partner shake the box. (This is an experiment to try to distinguish the competing hypotheses. The sound the object makes in the box provides evidence for one of hypothesis over the other)
- 5) If they can guess which of the two objects is hidden in the box, they get to keep the object. If they can't, you get to keep it.
- 6) Now put the object back into the collection. Now it's your partner's turn to hide an object and your turn to shake the box and guess what's inside.
- 7) See who has the most objects at the end of the game.

Things to discuss with your child:

If you want to make it easy for your partner to guess what's in the box, what pairs of objects would you choose? (Hint: you want to choose things that will sound very different from each other, like a cotton ball and a penny.)

If you want to make it hard for your partner to guess what's in the box, what pairs of objects would you choose? (Hint: you want to choose things that will sound very similar to each other, like a pencil eraser and a grape.)

What can you do when your hypotheses are hard to tell apart?

- 1) You can repeat the experiment and try to get more evidence. You will probably want to shake the box for a longer time if the items in the box sound similar (like a pencil eraser and a grape) then if they sound different (like a penny and a cotton ball).
- 2) You can design a new experiment to make the hypotheses easier to distinguish. Suppose instead of shaking the box, you tip the box back and forth in your hands: a grape will probably roll more easily than a pencil. Now the hypotheses might be easier to tell apart.

Scientists like it when evidence clearly supports one hypothesis over another. But sometimes, different hypotheses make similar predictions and it's hard to tell which hypothesis is correct. Just like you, scientists try to get more evidence if competing hypotheses make similar predictions and they try to design experiments that make hypotheses as easy to distinguish as possible.

More things to try:

- 1) Instead of starting with 2 objects and choosing one to put in the box, try starting with 3 or 4 objects. Or try telling your partner you're going to hide one of the objects from the whole collection. Or try telling your partner you're going to hide some object you find from anywhere in your home.

- 2) Is it easier or harder to guess what's in the box if you start with just two possibilities or if you start with lots of possibilities?

Things to discuss:

It's usually easier to tell hypotheses apart when you can narrow down the possibilities. If you have no idea what you're looking for, then it can be really hard to learn anything from your experiment.

Sometimes we'd like to know something and there might be lots and lots of possibilities. Scientists usually try to design experiments so they test just two or three possibilities at a time. It's a lot easier to understand what your evidence means if you know what the possibilities are!

