Lesson Plan: The Egg Drop Game

Topic/Question: Epistemology/How do we reason empirically?

Age Group: 5th grade and up

Time: about an hour

Materials: An uncooked egg, a hardboiled egg, a “blown” egg, sufficient uncooked eggs for every team of two or three students to have one, enough bendy straws for each team of students to have 10, masking tape, scissors, paper towels and a big garbage bag for clean-up

Description:

The idea for this exercise emerges from Wesley Salmon’s widely anthologized piece, “An Encounter with David Hume,”1 in which Salmon introduces what he calls “Hume’s bombshell.” Essentially, this the observation that since the entire scientific method is based on making predictions about future events from past experience and since, as Hume famously points out, we can never be certain that the future will behave as the past has, then, in a very real sense, all scientific reasoning is contingent at best, if not downright fallacious.

The intent of this exercise is to get students pondering empirical reasoning in general and to have them begin raising questions about whether it does make sense to make claims about what is going to happen from what has happened. In other words, is it reasonable to predict future events from past experience, even if the outcomes of those events are not necessarily certain?

To really capture students’ attention, begin the exercise by climbing on a chair and holding the uncooked egg over your head, above some sort of receptacle (a rectangular baking dish works great.) Ask “What will happen when I drop this egg?” Someone will

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1 Salmon, Wesley, “An Encounter with David Hume,” in Feinberg, Joel, *Reason and Responsibility*
answer “It’s going to break!” Follow up with “How do you know?” “Because I’ve dropped eggs in the past and they’ve always broken,” is the standard response. Say, “Well, let’s see,” and drop the egg. Of course, it breaks.

Point out to the class that what they have just seen is an example of what we could call “empirical reasoning,” that is, drawing conclusions about future events from past experience. Remind them (if the Salmon article has been referenced) that this is what Hume says we can never be certain of. But what are the implications of this? Does it mean that we’re never justified in reasoning empirically? Encourage students to talk about this and then suggest that this assumption can be tested.

Climb back on the chair now hold the hardboiled egg over your head. (Don’t let on that it’s hardboiled) Ask “What will happen when I drop this?” Students say, “It will break.” “How do you know?” “Because we’ve seen it happen before.” “Good! Does having seen it happen once make you more certain that it will happen again?” In general, students reply that it does, although usually, one or more want to press me on whether the egg is hardboiled, an inquiry to deflect at this point.

In any case, when the hardboiled egg is dropped, it doesn’t break like the first one did. This usually inspires a discussion about whether or not it was reasonable, based on past experience, to believe that it would, which gets the class deeper into the philosophical question under examination. Most students will say that it still made sense of assume that the egg would break, even if we couldn’t be certain about it. It’s not like it was an outlandish assumption like, say, the egg would float when dropped. So, as long as there is pretty good reason to make the inference, the inference is reasonable.
Finally, climb back on the chair and hold up the blown egg. “What will happen now?” “Is it hardboiled?” students ask and you can truthfully reply that it isn’t. “Well then, it will break,” they answer with assurance. “Let’s see.” Of course, this egg, when dropped, falls gently and while it may crack, it rarely really breaks. Once again, this opens the door to a discussion about whether we are justified in reasoning empirically, given the uncertainty of future outcomes.

As this discussion winds down, segue into the point that, as a matter of fact, we are pretty good at making predictions about what’s going to happen, even if the philosophical foundation of such claims is rather sketchy. The exercise we are about to engage in is meant to demonstrate this and to help us reflect upon how good (or bad) we are at reasoning empirically.

Students are divided up into teams of two or three. (Four is acceptable, but less than ideal, since it usually means that at least one team member either gets left out or checks out.)

Teams are told that they have a task set before them, which is to build a device that will protect an uncooked egg from breaking when dropped from a height of about eight feet. The only items they can use, however, to build their device are those that are to provided to them.

Pass out to each group ten (10) flexible straws and about two (2) yards of masking tape. Make as many pairs of scissors available as possible. Teams now have half an hour to build their contraption. They can cut their straws and/or tape. They can build an egg “catcher” or an egg “protector.” The only rule is that they are limited to the supplies they have received.
At the end of the allotted time, each group must make a brief presentation to the class. In it, they must share with the class the name of their contraption and give an argument, using empirical reasoning, as to why they think their device will succeed (or fail.)

Some teams like to have their egg to work with—especially, for instance, if they are building a protector around it—it’s fine to give eggs to groups to work with. However, advise them strongly not to break their eggs during development of their contraption: groups will only get one egg to work with. (Sometimes, if I have an extra, I’ll break this rule; but again, it’s important to impress upon students the importance of taking care while they work, and also, to have paper towels handy should an accident occur.)

When all the groups have finished making their contraption, each group gives their short presentation, including the arguments about why the device will succeed (or fail.) Place all the contraptions on a table where everyone can see them. Then, as a class, vote on which devices students think will be most successful (each student can vote for one device) as well as which devices we think will be least successful. By adding the positive votes up and subtracting the negatives for each device, you can create a list, from lowest to highest score, predicting which devices students think will be least and most successful.

Now, based on the rankings, the class can see how well they are able to predict future events from past experience. Presumably, the devices that have been predicted to fail should fail; the ones predicted to succeed should succeed—at least that’s what our confidence in the ability to reason empirically depends upon.
Proceed, then, by turns, to drop each device, starting with the one the class has said will be least successful. Hilarity ensues—and many paper towels are employed in the clean-up. Typically, if a device survives the initial fall, it is placed aside, for a second, or even third drop from some higher spot. (At Cascadia Community College, where I teach, we often use a third-floor balcony with a drop to the sidewalk below for those that survive previous drops).

In any case, once all the devices have been dropped, the class can able to revisit the initial question about empirical reasoning. How well did we do? That is, how many of the devices that we predicted would succeed did succeed? What about the ones that we predicted would fail? What does this say about our ability to predict future events from past experience?

Usually, our predictions tend to be fairly reliable, but also, just as often, there will be some anomalies. For instance, a contraption deemed to be ineffective will succeed heroically, or vice-versa, one expected to do well, will fail on its first attempt. Again, this provides lots of opportunities for thinking and talking about empirical reasoning and succeeds in providing a fun and engaging forum for doing so.

Admittedly, it’s not uncommon for some of the subtler “philosophical” points to be overwhelmed by the overall energy of the exercise. It’s easy enough for students to be far more focused on the project of designing their contraption than on thinking about empirical reasoning. Two points are worth making in response to this.

First, some of that can be counteracted by making sure that students take seriously the component of the exercise that asks them to present an argument for the likely success or failure of their device. If groups invest themselves in explaining clearly what
they think will happen when their device is dropped, they will automatically have to really consider the degree to which past experience informs future predictions.

And second, even if “serious philosophy” is not the main outcome of the exercise, one can still count the activity a success for a number of reasons. Above all, it encourages students to work together on a project that’s fun and challenging. But also, by its very nature, students will be engaging in empirical reasoning throughout the length of the activity. They will consistently be making predictions about the future based on past events. So even if this subject is not broached at great length during the course of the exercise, it will sink in to students’ minds for future exploration. And even though this prediction is based on making such an uncertain prediction, I’m nevertheless confident that it’s true.