

# Educational Innovations<sup>INC</sup><sup>®</sup>

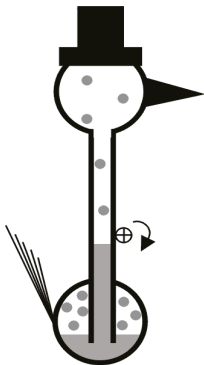
DB-100

## Drinking Bird Demonstration

When the felt on the head of the sealed glass bird is wet with water, the bird pivots back and forth into a glass of water. It gives the appearance of drinking!

### Instructions:

Wet the head of the Drinking Bird, and place a full glass of water near it so that when the head tips forward, only the beak comes in contact with the water. Most Drinking Birds work without adjustment! Sometimes a small adjustment to the pivot point of the bird is needed. Carefully move the metal clip up or down the glass tube, (ca. a millimeter), until the Drinking Bird just balances in a vertical position.

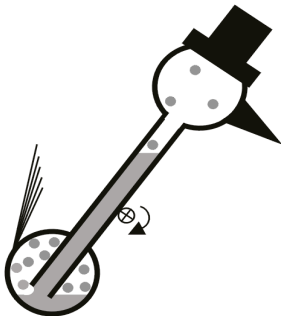


### Explanation:

#### Step #1

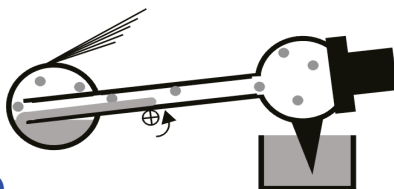
Water requires heat to evaporate. In this demonstration, water from the wet felt on the outside of the head evaporates, causing the vapor inside the head of the bird to cool. This reduces the pressure of the vapor at the top, allowing the higher pressure in the lower bulb to push up the column of liquid. The pressure of the vapor in the top bulb decreases for two reasons:

- As the vapor cools, the vapor contracts. Notice the top volume of gas decreasing, and
- As the rising liquid near the top cools, less liquid evaporates into the head and more vapor returns to the liquid state. Since this demonstration only works with a sealed liquid that has a high vapor pressure, this is a major factor.



#### Step #2

As the head cools further and more liquid inside the bird rises, the center of gravity of the bird rises, causing the bird to become unstable and tip forward.



#### Step #3

Eventually, the beak of the bird tips forward enough to rewet its head. When this happens, the bottom end of the glass tube in the lower bulb is above the remaining liquid. Vapor from the bottom travels to the top until the pressure is equalized. At the same time, liquid in the column flows to the bottom. As the center of gravity of the bird is lowered, the bird tips vertical and the cycle starts over.



5 Francis J. Clarke Circle  
Bethel, CT 06801  
[www.teachersource.com](http://www.teachersource.com)

Phone (888) 912-7474  
Fax (203) 229-0740

[info@teachersource.com](mailto:info@teachersource.com)

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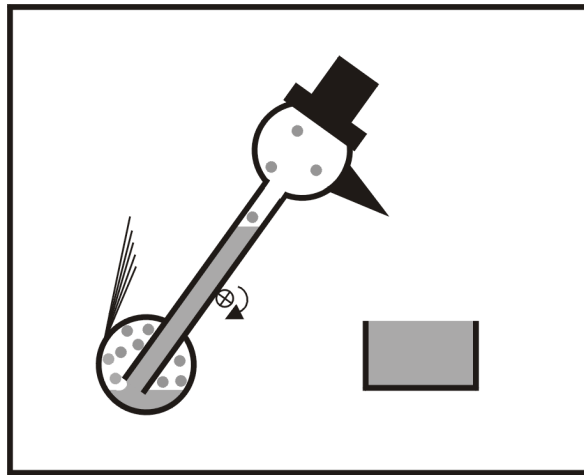
### Suggested Classroom Activities:

#### I) Classroom Discussion

- Q. Is this an example of perpetual motion?  
A. No. The cycle repeats itself only as long as the water evaporates from the head.
- Q. What is needed in order for the Drinking Bird to work?  
A. A difference in temperature between the head and body.

#### II) Student Challenges

- A. Observe the operation of the Drinking Bird and explain how it works.
- B. Discover a way to make the Drinking Bird cycle faster.
- C. Predict what will happen if a fan blows air toward the Drinking Bird. Does it make a difference which direction the air blows?
- D. Predict the result of using warmer or cooler water in the glass.
- E. How long will the bird cycle without needing a refill of the water in the open container? Can you find a way of causing the bird to cycle longer?
- F. Is there a difference in the cycle rate on a humid day vs. a dry day? Can the bird be used to determine the relative humidity in the air?
- G. Predict the result of placing a small inverted aquarium over the bird. Does this cause the bird to cycle more or less? (*Note: as soon as the water in this closed system reaches its vapor pressure, water from the felt can no longer evaporate and the bird stops.*)



- H. Can you attach a thread to the bird so that it does useful work, e.g. lifting a small paper clip?