Introduction:

Water clocks were used in ancient times, because they did not depend on sunny days to keep time by. In a water clock an upper container drips at a constant rate into another container below it, which indicates the passing of time since the clock was started. However, it proved to be a very difficult task to keep accurate time in this way.
Activity #1

Grade Level: 6-12
Time: 45 minutes

I. **Learning Objectives and Expected Outcomes**: What will the student gain from this experience?
   - Students will investigate how the amount of water can affect a water clock’s accuracy.

II. **Group Discussion**
   - Before you begin, have the class make educated guesses (hypothesis) about the outcome of the experiment.

III. **Materials**
   - Thumbtack or pin
   - Watch or stop watch
   - Ruler
   - Water
   - Rectangular plastic container (about 1 gallon)
   - Cylindrical tall glass jar
   - Two chairs
   - Masking tape
   - Cup
   - Marking pen

IV. **Procedures**
   - Measure the height of the rectangular plastic container and mark the half and ¾ points on the side.
   - Use the thumbtack to punch a small hole in the bottom of the container in about the middle, and position the container between the two chairs, and the hole is still open.
   - Place the cylindrical glass on the floor beneath the hole in the container that is resting on the chairs.
   - Someone needs to hold their finger tightly over the hole, while it is being filled with water, completely fill the container with water. Keep a cup of water nearby to refill the container as it empties, you will need to keep the container as close to full as possible at all times.
   - Take your finger off of the hole and let it drip into the glass for 1 minute (please time this with a watch or stop watch). (Modification: you could time the water for a longer period of time for more accuracy)
   - Put your finger back over the hole, after 1 minute has passed, and you can empty the container, for now.
   - Mark the level of the water in the cylindrical glass with masking tape, and then measure the distance from the bottom of the glass (this is now your control minute).
Using the measurement that you got from step 7, measure off four more marks above the 1 minute mark.

Return the plastic container to its spot on the chairs, and with your finger over the hole fill it to the ¾ mark the time. Remove your finger and time how long the water takes to reach each of the marks on the tape. Do not keep refilling the container.

Repeat step 9 but only fill the container to the ½ way point.

V. Assessment

Use the following chart for your class to fill out showing how long it took for the water to reach each mark, then use the follow up questions.

<table>
<thead>
<tr>
<th>Control</th>
<th>3/4 Full</th>
<th>½ Full</th>
</tr>
</thead>
<tbody>
<tr>
<td>1 Minute Mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>2 Minute Mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>3 Minute Mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4 Minute Mark</td>
<td></td>
<td></td>
</tr>
<tr>
<td>5 Minute Mark</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

1. Was your hypothesis correct?
2. How did starting at the ¾ mark compare to the first (control) minute?
3. How did the times change in comparison to the level of water in the plastic container?
4. How could you make the water clock more accurate?

VI. References

“Water Clock: Does the Amount of Water in a Water Clock Affect its Accuracy?” Galeschools.com. 14 Apr 2010