SUGGESTED ACTIVITIES

(*The Water Cycle*)

From *Invitations to Science Inquiry 2nd Edition* by Tik L. Liem:

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From *Harcourt Science* Teacher's Ed. Unit E: (For ALL grade levels)

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Cloud in a jar (Grade 3)	D23	Condensation
Making Raindrops (Grade 3)	D23	Precipitation
Getting Fresh Water from Salt Water (Grade 4)	D32-33	Evaporation

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RECYCLE THE WATER

A. Question: Can steam be transformed into water?

B. Materials Needed:

1. Two shallow trays or regular dinner plates.
2. Electric water kettle.

C: Procedure:

1. Heat water in a kettle until boiling.
2. Suspend a tray or plate in the steam or water vapor that comes from the kettle, and place the second plate under the first to catch the water drops (condensate). (Put cold water in the first plate).
3. Pour the water from the second plate back in the kettle to complete the cycle.

D: Anticipated Results:

Students should be able to collect steam and see it condense into water.

E: Thought Questions for Class Discussion:

1. What made the steam or water vapor turn back into water?
2. Would the steam also condense if the top plate was filled with hot water?
3. What are conditions for clouds to turn into rain?
4. What makes the water evaporate in nature?
5. What can the pouring back of water from the lower plate into the kettle be compared with in the natural water cycle?

F: Explanation:

The steam or water vapor is produced in the kettle, because the water in the kettle is heated. When the steam hits the cold plate, it condenses back into water. The kettle can be compared to the ocean water being heated by the sun rays. The water vapor accumulates in the higher layers of the atmosphere to form clouds. When these clouds move into colder regions, they saturate the air with water vapor and the cold temperatures turn it into rain condensation. This may be compared to the steam hitting the cold surface of the first plate. The rain water in nature flows into rivers and these flow back into the ocean.

AT WHAT TEMPERATURE IS DEW FORMED?

A. Question: How is dew formed?

B. Materials Needed:

1. A beaker or regular drinking glass.
2. A thermometer (-5° to 50º or 100°C).
3. Ice cubes.

C: Procedure:

1. Fill the beaker almost full with water and add a few ice cubes.
2. Keep track of the temperature of the mixture and observe carefully the out side of the beaker or glass.
3. Stir the mixture once in a while with the thermometer (carefully) and note the temperature at which the dew is first formed on the outside of the glass (look for a dullness on the glass).

D: Anticipated Results:

Students should observe dew formation outside the glass.

E: Thought Questions for Class Discussion:

1. Where does the dew on the outside of the glass come from?
2. At what temperature was the dew formed?
3. Is there always the same amount of the water vapor in the air?
4. Will the dew point be higher or lower on humid days?
5. Where do we encounter a similar event inside the house on winter?

F: Explanation:

The ice cubes in the water are cooling the mixture slowly down and depending on how much moisture there is in the air, the sooner or later the water vapor will condense on the outside of the beaker; thus the higher or lower the dew point will be respectively.

The drier the air around the beaker is, the lower the temperature has to be, before any water vapor will condense on the beaker's surface, and thus the lower the dew point.

Just after a rainfall the air is very humid, meaning that this percentage of water vapor in the air is high, and thus the dew point is also high. On the dry days or in areas of low humidity, the temperature has to drop quite low before any dew drops are formed on the grass in the morning.

THE FROSTY CAN

A. Question: What are the conditions for frost formation?

B. Materials Needed:

1. A tin can (from which the label is taken off).
2. Crushed ice and coarse table salt.
3. A thermometer and stirrer.

C: Procedure:

1. Fill the tin can, from which the label is taken off, with crushed ice and a handful of salt.
2. Place the thermometer in the can and stir with a separate stirrer.
3. Have students read off the temperature every half minute.
4. Have other students observe carefully the outside surface of the can and indicate to those observing the temperature, the moment that they observe frost formation (when the shiny surface gets dull).
5. A further extension of the activity might be the graphing of the data of observed temperature and the time elapsed.

D: Anticipated Results:

Students should observe frost formation outside the tin can.

E: Thought Questions for Class Discussion:

1. What is the purpose of the salt mixed in with the crushed ice?
2. How low does the temperature inside the can have to be in order to form frost on outside?
3. What do you expect the temperature of the ice and salt will do after the moment that frost is formed?
4. After observing the shape of the graph after frost formation, what is the process of frost formation doing: absorbing or giving off heat?
5. Where does the frost come from; what is needed in the air?

F: Explanation:

The salt in the crushed ice makes the ice melt in the beginning, but brings the temperature down below the normal freezing point of water (0ºC). The moisture in the air, hitting the cold surface of the can, turns into solid state (frost) without passing the liquid state: **sublimation.** This process, just like condensation, is giving off heat, which is why the graph levels off after frost formation.