Lesson 13: Design of self-warming/cooling device with use of exo/endothermic reactions

Objective: Students will be able to evaluate the results of their (and classes) chemical reactions and class discussions to design and then construct a self-warming/cooling device for use.

Learning Goal: Students undertake a design project to construct, test, and modify a device that either releases or absorbs thermal energy by chemical processes.

Vocabulary: use and review all previously learned vocabulary from the unit.

Engage:

1. If available, teacher shows students a clip from EdTube or movie clip showing hypothermia and goes over areas most commonly affected. Students can also read article, etc. to gather some quick information about hypothermia, heat stroke, etc (other examples of cooling and warming devices) to inform their choice of a device.
2. If not done previously, students are given specific assignment criteria for final project design: self-warming clothing.
3. In groups, students decide on type of device they will design.

Explore:

4. If available, teacher gives students materials (from T4T) that they can choose from to make their device (ex. glove, coaster, headband, hat, etc.). If no materials, options for materials to be used can be researched, examples shown, or given to class.
5. EXTRA: Students can research properties of materials (given in class) to help decide on which would be best to use (i.e. melting point of material, cost, flammability, weight, etc.)
6. Students decide on material (or combination of materials) they will use in their design of their device.

Explain:

7. Teacher discusses with class the parameters and criteria for device (how will it be assessed/presented)
8. Teacher goes over assignment rubric with class.

Elaborate:

9. Students begin to design their device with a diagram first with labels and explanation of device.
10. Students make a poster diagram of their piece of clothing with appropriate labels, that address the following:

- What type of device will they make? Why? What will it be used for?
- How will the chemicals be kept separate? Stored?
- How will the chemicals mix when device is being used?
- What materials (fabric) will the device be made of? Will it be a combination of materials? Why?

11. Students complete a gallery walk analyzing and commenting on classmates' designs.
12. Students revise design diagram based on peer and teacher comments.
13. If materials available, students construct their piece of self-warming piece clothing

Evaluation:

14. Students' final design of self-warming clothing will be evaluated based on assignment rubric.