

# INFUSING GLOBAL COMPETENCIES & DESIGN THINKING IN SCH4U THERMOCHEMISTRY STRAND

STAO CONNEX (/USERS/STAO-CONNEX)

**TRAM NGUYEN PHAM**

**STAO PROJECT INNOVATION**

**SECONDARY B 2017 COHORT**

**TOPIC:**

**“INFUSING GLOBAL COMPETENCIES & DESIGN THINKING IN SCH4U THERMOCHEMISTRY STRAND”**

**INTRODUCTION:**

In chemistry grade 12, a task that summarizes learning is often placed at the end of the unit to summarize and demonstrate learning. This time I did it differently in the Thermochemistry strand: flipping the order of inquiry and put the unit task at the forefront per Garfield Gini-Newman's (<https://goo.gl/FauZwu>) suggestion.

Students were asked to design an actual hot or cold pack that took into account consumers' preferences. The students had no background about this at the beginning, but as I uncovered the curriculum of this unit, the students revisited their task regularly, modifying their previous plans with new information. I used a Thoughtbook template to assist students in this iterative design process.

Students used Lab Quest to quantify the amount of heat evolved or absorbed by their hot/cold pack prototype. Prior to being able to independently use a Lab Quest, students were scaffolded in a guided lab in which they heated copper and used calorimetry to approximate the temperature of a Bunsen burner. Subsequently, they conducted a more open inquiry in which the heat of neutralization is determined.

Students eventually got to the design stage where they were autonomous in several aspects, including:

- Conducting consumer preferences with interviews, surveys
- Selecting chemicals for their commercial products
- Designing their procedure and product's appearance
- Using technology to quantify the amount of heat produced/absorbed by their products
- Using web 2.0 tools to produce an ad/informercial/pitch that accompanied their final hot/cold pack product.

Students were essentially running their own start-up, making decisions in teams and marketing and defending their products.

This approach of doing inquiry allows students to foster many global competencies, namely collaboration, creativity & entrepreneurship. The students were engaged and so was I. I took a step back literally to the sidelines and let the students drive their inquiry. I truly felt like a facilitator in their learning process; no longer the one who always took the central stage. The freedom to explore reaps a big reward for them.

Innovation means different things to different teachers. This project is innovative to me personally because I took the chance to explore inquiry in a novel way that I haven't done before. I feel the path to innovation is paved with many incremental changes that we teachers embrace.

**Big idea addressed with this task:**

Energy changes can be described quantitatively.

**Expectations addressed:**

A1 (A1.1- A1.8, A1.11 -A1.13)

D2 (D2.1-D2.4)

Time allotted from the start to finish: ~ 14 periods

TIMELINE	LEARNING ACTIVITY EXPLAINED	HANDOUTS
DAY 1	<p>“INTRODUCE THE INQUIRY-DESIGN TASK</p> <p>-STUDENTS WERE GIVEN CLASS TIME TO COLLABORATE INITIALLY ON THE TASK</p> <p>-THEY WERE TO COME UP WITH AS MANY QUESTIONS ABOUT THIS TASK AS POSSIBLE</p> <p>“INTRODUCE STUDENTS TO “MY THERMOCHEM THOUGHTBOOK” TEMPLATE</p>	<p>““INQUIRY TASK INTRODUCED STU” PPT</p> <p>“MY THERMOCHEM THOUGHTBOOK</p>
DAY 2	<p>DAY 1 OF UNCOVERING THE CURRICULUM</p> <p>“TYPES OF SYSTEM: CLOSED, OPEN, ISOLATED</p> <p>“SPECIFIC HEAT CAPACITY, EXO-, ENDO- PROCESSES</p> <p>“<math>Q = mC\Delta T</math></p>	<p>“1A. INTRO THERMOCHEM</p>
DAY 3	<p>“ENTHALPY &amp; ENTHALPY CHANGE</p> <p>“CALC. <math>\Delta H</math> FROM BOND DISSOCIATION ENERGY</p> <p>“WAYS TO EXPRESS ENTHALPY CHANGE</p>	<p>“2A. ENTHALPY &amp; ENTHALPY CHANGE</p>
DAY 4	<p>“FORMATIVE QUIZ: ENTHALPY REVIEW</p> <p>“TOOK UP QUESTIONS FROM PRACTICE QUESTIONS IN LESSONS</p> <p>“CALORIMETRY FLIPPED CLASSROOM (PPT)</p>	<p>“3B. CALORIMETRY (FLIPPED) &amp; BUNSEN BURNER LAB STUHANDOUT</p>
DAY 5	<p>“CALORIMETRY &amp; BUNSEN BURNER LAB PERFORMANCE DATE</p> <p>“CALCULATING ENTHALPY OF PHASE CHANGE</p>	<p>“3C. CALORIMETRY, MOLAR H PRACTICE WKSHEET (AS HW)</p>

<b>DAY 6</b>	<ul style="list-style-type: none"> <li>" THERMOCHEM QUIZ 1</li> <li>" TOOK UP CALORIMETRY &amp; BUNSEN BURNER LAB</li> <li>" GIVE CLASS TIME FOR GROUPS TO MEET TO WORK ON HOT/COLD PACK PROJECT. TEAMS TO MAKE USE OF THE THOUGHTBOOK</li> </ul>	
<b>DAY 7</b>	<ul style="list-style-type: none"> <li>" REVISITING PHASE CHANGE CALCULATIONS (AS STUDENTS HAVE SOME DIFFICULTIES</li> <li>" TOOK UP QUESTIONS FROM HW/PRACTICE</li> <li>" GAVE FORMAL LAB- ENTHALPY OF NEUTRALIZATION IN ADVANCE FOR STUDENTS TO PREPARE FOR PRE-LAB PREPARATION AND DESIGN THEIR OWN PROCEDURE (MATERIALS WERE GIVEN)</li> </ul>	<ul style="list-style-type: none"> <li>" 3D. PHASE CHANGE CALC. REVISITED</li> <li>" 4. FORMAL LAB- ENTHALPY NEUTRALIZATION</li> </ul>
<b>DAY 8</b>	<ul style="list-style-type: none"> <li>" SPONTANEITY &amp; PROPERTIES OF DELTA H</li> <li>" COLLECTED THE DESIGNED PROCEDURE OF ENTHALPY OF NEUTRALIZATION LAB FROM STUDENTS TO GIVE FEEDBACK</li> <li>" GIVE CLASS TIME FOR GROUP TO WORK ON HOT/COLD PACK PROTOTYPE</li> </ul>	<ul style="list-style-type: none"> <li>" 4. SPONTANEITY &amp; PROPERTIES OF DELTA H</li> </ul>
<b>DAY 9</b>	<ul style="list-style-type: none"> <li>" ENTHALPY OF NEUTRALIZATION LAB PERFORMANCE DATE</li> </ul>	
<b>DAY 10</b>	<ul style="list-style-type: none"> <li>" STANDARD STATES</li> <li>" HESS' LAW</li> <li>" DH OF FORMATION</li> <li>" GIVE CLASS TIME FOR INDEPENDENT PRACTICE</li> </ul>	<ul style="list-style-type: none"> <li>" 5. STANDARD STATES, HESS' LAW, DELTAH FORMATION</li> </ul>
<b>DAY 11</b>	<ul style="list-style-type: none"> <li>" FINAL MEETING TIME FOR HOT/COLD PROJECT</li> <li>" BUFFER DATE</li> </ul>	
<b>DAY 12</b>	<ul style="list-style-type: none"> <li>" HOT/COLD PACK PRODUCT EXPO DAY (CAROUSEL STYLE)</li> </ul>	



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f t G+ this (http://stao.ca/...  
http://stao.ca/...  
catalysts/infusing-  
global-competencies-  
and-design-thinking-in-  
sch4u-thermochemistry-  
strand)

## RESOURCES

Hot/cold pack design task support docs + student work (<https://goo.gl/9wsqGX>)

## ELEMENT

Inquiry (/expert-elements/inquiry)



**RETURN TO CATALYSTS** (/classroom-catalysts)

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