Precision Heating

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- PROBLEM STATEMENT
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- EVALUATION/ANALYSIS
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  - Analysis/Modifications for Final Trial
- REPORT RUBRIC

The project requires the student to design a system that, by heat of dissolution increases the temperature of 100 mL of water by 10oC in 10 minutes.

The students initially do not recall their Calorimetry experience from Chemistry. However the worksheet and lab questions (which is the same lab previously done in the HS course) are a pleasant refresher. Since Calorimetry understanding is essential, tutoring after school was used for the few who did not understand it the first time around.)

Concept map (required to use the program) was done individually and then shared with the project group.

Salt Selection: The group must select and justify one salt from a list of 10. The criteria are heat release, safety, solubility and cost, displayed in a spreadsheet. Some groups use a brute force method, while others are more systematic (and efficient) in their literature search. Calculation errors (conversions, accounting for hydrates etc.) bound. These errors are corrected only if there is a safety issue. The key calculation is to put the basis on grams of salt required to increase 100 mL of water by 10 ^{o}C. This number allows for an efficient check of their work.

Equipment: Groups design and acquire their own equipment. It is presented in class prior to testing, so strengths and weaknesses can be identified. Dimensioned drawings are emphasized, but for the first project are rather crude. Usually a number of factors are overlooked in the initial design: 2 thermometers, efficient volumes, agitation, and heat loss to surroundings.

Test: Some groups hit the target and others miss badly because of errors above. This is an eye-opener for consequences of errors. They have a chance to regroup, analyze the data and the second trial generally goes well.

This project has a group report (all others are individual.) This allows all students to see how to construct a quality report.

Excerpts from student reports and lab procedures will be available soon.