

Appendix C

PST7's whole class claim and evidence discussion related to temperature effect on reaction rate in Experiment 13.

Whole class beginning question: (the PSTs decided on these questions) 1)How does temperature affect the rate of reaction in a chemical reaction? 2)How does concentration affect the rate of reaction in a chemical reaction? 3)How does catalyst affect the rate of reaction in a chemical reaction? 4)How does contact surface affect the rate of reaction in a chemical reaction?

Whole class claim and evidence discussion: PST 7: Friends, our group's claims are as follows: In a chemical reaction, as the temperature increases, the reaction rate increases. As the concentration increases in a chemical reaction, the rate of the reaction increases. In a chemical reaction, the rate of the reaction increases as the contact surface increases. In a chemical reaction, the catalyst increases the reaction rate. How did we come to these claims? When we think of it as temperature, we had the temperature levels we set, such as 25, 35, 50, 75 and 100. We measured these temperatures with the thermometer. For example, when the thermometer reached 35 Celsius degrees, we took the test tubes including sodium thiosulfate and hydrochloric acid from the water bath and added one into another. As soon as we saw the color change, we stopped the time and recorded it. You have done similar things. We have repeated the same for other degrees. Then we generated the time-temperature graph. As you see, reaction with higher temperature takes less time to take place. In other words, as the reaction temperature increases, the reaction time decreases. So time decreases, reaction rate increases.

PST9: so, does it mean that time and rate of reaction are the same?

PST7: no it does not.

PST3: Why did you generate time-temperature graph to support your claim then?

PST7: because as temperature increases time decreases and reaction takes place faster.

[some conversation continued here]

LEC: What do you see when you look at time-temperature graph?

PSTs 1, 6, 2, 3, 7, 9: time decreases as the temperature increases.

LEC: Has every group agreed on this?

PSTs: yes

LEC: (showing the temperature-time graph) What claim can someone who looks at this graph construct? What claim did you construct?

PST7: related to this?

LEC: Yes

PST7: the reaction rate increases as the temperature increases in a chemical reaction.

LEC: (showing the time-temperature graph that PST7's group has prepared on the board), has it increased?

PST7: No. It may be wrong, but I said that since reaction time decreases as temperature increases, the reaction rate increases.

PST3: we agree that as temperature increases time decreases, but you only generated time-temperature graph to support your claim related to reaction rate. They are inversely proportional.

PST 9: it seems as though you investigated the effect of temperature on time, but we all investigated the effect of temperature on reaction rate, and your claim is temperature increases as reaction rate increases. I think, it is good idea to generate a temperature-reaction rate graph.

[some conversations continued here]

PST7: Yes we agree that temperature-reaction rate graph support our claim best but time-temperature graph also prove evidence for our claim since we first record time and say that time and temperature are inversely proportional, and based on this time we calculate reaction rate.

[some conversation continued here]

LEC: so my understanding from your dialogue is that temperature and reaction rate graph represents best for your claim that temperature and reaction rate are directly proportional. However, anyone who thinks that time is important to show reaction rate and temperature relationship can use it.

PSTs: yes

LEC: Does anyone have a different or additional view than that?

PSTs: No

LEC: so, what happened next? (PST7 started presenting her group's claim on concentration)

Analytic framework score: Question: 15; Claim:15; Evidence:10 Holistic Framework score:15

**In Experiment 13, the PSTs investigated the effects of temperature, concentration, contact surface and catalyst on reaction rate. Group 1 represented their data with calculation at the bottom of the board in black; Group 2 represented their data in red at the top of the board. Group 3 represented their data in black and blue color in the middle of the board. Group members: PSTs 1, 4, 6 in Group 1; PSTs 5, 7, 8 in Group 2, and PSTs 2, 3, 9 in Group 3.*