PDP Team:

2017-06

Activity Name:

Molecular Orbitals

Team Members:

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Ana Kareh, Graduate Student, Chemistry, University of California, Santa Cruz

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Audience:

30 STEM transfer students from community college

Venue:

Workshops for Engineering & Science Transfers (WEST) program for STEM transfer students, University of California, Santa Cruz, September 18-20, 2017

Description:

The goal of the activity was for learners to construct the energy diagrams and structural depictions to describe molecular orbitals, then using this model to explain an observation of this chemical system. Our main STEM practice goal was improving a model with theory to explain a phenomenon**.** According to our rubric, we applied three dimensions of the core practice 1) articulating which aspects of a phenomenon are important to include in a model (theory); 2) iterative introduction of complexity to a simpler model; 3) explaining phenomenon with multiple related models.

First, the activity involved a raising questions component by showing students chemical phenomena such as molecules that appear different colors, or various chemical reactions, as they rotated through three stations. Students were asked to engage everyone else in the group of each station and write down their questions. After this, students moved forward to the Expert introduction sections where learners

participated in a collaborative discussion lead by a facilitator. In this section, everyone was encouraged to share their opinions and knowledge related to the topic. Each of the Expert groups shared their content understanding as a lightning summary to other teams. Our design enhanced learner's content knowledge and created an equitable environment for the main investigation by providing different pathways of learning, such as the Expert introduction section and having the lightning lecture, which helped learners feel part of a scientific community. Learners were provided with different resources to pursue their investigations (paper, whiteboards, markers, clay, molecular model kits, handouts from expert introductions), which allowed them to brainstorm and engage in a variety of forms. Facilitators closely observed each group justifying their result as a drawing, in writing, and in verbal format. At the end of the activity, learners individually drew their final energy diagram and structural representation to indicate the important chemical outcome and provided a written rationale for the design as in the content prompt. These were collected for our scoring after the activity.

<u>How student responded to activity:</u>

"Here we had to figure it out based on our preexisted knowledge, no online help. This was frustrating at times but it was a positive challenge in the end. It felt good to know that within time, perseverance and some guidance a better understanding of the subject matter is possible".

"It was a collaborative explorative approach to learning information. Rather than being taught the material, we were really exploring and learning concepts from the ground up. It was cool that grades were not our motivation (chemistry)".