

Summary of PDP activity – Team 2017-11

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We taught an inquiry-based activity, “Measuring the temperature of stars”, for 10 REU and 4 University of Hawaii undergraduate students. The main content goal of our activity was to use the concept of blackbody radiation to select the hottest or coolest star in a given field from the Pan-STARRS survey using a color-color or color-magnitude plot. Our main practice goal was data selection and cleaning, where a large part consisted of selecting only data related to the task and their interpretation, which is important when working with large databases.

We used stations with images of different clusters, each in two different filters along with a color image, as a tool for raising questions. Then we let students brainstorm and write their questions down on strips of poster paper. When they were done, we sorted the poster strips in categories by the nature of the phenomenon they were curious about, and put them up on a wall. Then we instructed students to do a ‘gallery walk’, where they could walk freely around the room and read all the questions on the walls. Each student should pick up a question he/she wanted to investigate and then we grouped students with similar questions for investigations.

We prepared multiple datasets, each containing a single star cluster and a dwarf galaxy. Each group could choose a cluster they wanted to investigate, so the learners could claim the ownership, and their results were compared and put into a wider context during the synthesis. Since the Pan-STARRS database is huge and executing mysql queries would take significant time, we had prepared a small database cutouts containing only important columns and rows. This way every group was able to query the data they needed within the allocated time, and it was much easier for them to identify data they would not need and filter them out. We held a jigsaw conversation after the first block of investigations, where students from different groups sat together and shared their progress and the challenges they were facing, alongside with the solutions.

To include the Equity and Inclusion element into our activity, we emphasized the concept of a growth mindset and explained this to the students during the introduction. We provided multiple software plotting tools for students with various levels of coding experience, from the user-friendly java app Topcat, to python code snippets, and also myqsl query templates for database mining.

At the end of the investigation each group prepared and presented a poster with their findings and also challenges they faced during the process. Each student responded to a written prompt and was scored according to our rubrics based on the answers to the stated questions. We only scored the students based on their knowledge of the core practice. Two points maximum could be awarded for each of

the two practice statements on our rubric – the data selection and data interpretation. Four of the ten learners scored a four out of four, and several were within a point from a full score, displaying a sufficient understanding of at least one rubric dimension. We also had learners who were unable to be assessed in a rubric dimension, but they demonstrated an adequate understanding during the actual inquiry activity and the jigsaw. Overall, the majority of the students scored well, and they were able to demonstrate their understanding of data selection and data interpretation on their posters.