2021 STARS Crystal-Growing Summer Camp Volunteer Service Hours Report and Verification

After seeing the success of the 2021 Timber Ridge Crystal Growing Competition and after seeing all those young scientists being so excited to learn about science and crystallography, we were inspired to host a first-ever STARS Crystal-Growing Summer Camp to help further spur their love of science. This week-long program introduced students K through 12th grade to a variety of topics related to crystal-growing, such as the theories of crystallography, the methodologies of taking observations and recording data on a lab notebook, the process of setting up and maintaining a crystal solution, how tonic water and highlighter ink can be used to grow glow-in-the-dark crystals, how bioluminescence and triboluminescence relates to crystallography, and of course, how crystallography can be used in the scientific field to treat diseases, such as cancer, through X-ray diffraction, structure determination, small molecule design, and therapeutic drug discovery.

The summer camp took place entirely online (on Zoom) and was completely free of charge. We delivered quality information to these elementary, middle, and high school students in the hopes to inspire them in this very promising and vanguard field of crystallography. Even if they eventually choose not to pursue crystallographic research in the coming years, we hope that the experience they gained by participating in our summer camp will be very useful and helpful for them, since the analytical and critical thinking skills required for crystallography can be easily applied to other fields of study, such as bioinformatics.

Because the summer camp required a convenience and an assured safety for students, we decided to have students only using salt and sugar to make the crystal solutions. We made this decision because the compounds are relatively simple and safe, and they could be readily found in many households. While these small compounds of salt and sugar may seem very common placed and sometimes even trivial, there is no doubt that these simple compounds can introduce students to the complex field of crystallography. How? The methodologies and crystallization theories necessary to crystallize salt and sugar are very similar to those of crystallizing macromolecular crystals, such as DNA/protein complexes, which can be used to treat diseases. Moreover, the patience and persistence that students gain through these simple crystallization experiments eventually help prepare them for more complex experiments in the future.

Each day, from July 5th to July 8th, STARS President, Susanna Huang, and three other STARS Team members Arya Oak, Selina Huang, and Achyutan Narayanan each taught rotating sessions of students K-12th grade from 7:50am to 11:50am.

Susanna Huang guided the students through four different hands-on crystal-growing experiments on each of the four days: (1) growing salt crystals out of supersaturated and undersaturated solutions, (2) growing glow-in-the-dark highlighter ink salt crystals, (3) growing sugar crystals with and without a crystal inducer, which was the string of yarn), (4) growing salt crystals on top of a crystal inducer, which was the cleaned granite rock, explaining elaborating on the necessary steps needed for each different experiment on each different day, teaching the importance of precision and accuracy, explaining the relationships between temperature, solute concentration, rate of evaporation, and rate of crystal formation, explaining how to maintain a solution with a seed crystal, which acts as a crystal inducer in a saturated solution.

Achyutan Narayanan guided the students through the note-taking process for each day's experiments with our custom-made 2021 STARS Summer Camp Crystal Journal printables that students used for each observation entry. He held discussions with the students and had them compare observations and inferences before discussing what they might mean for the experiment. He emphasized the importance of units and the importance of tracking the data correctly. He also had group activities, one of which he used to have students rank a series of aluminum potassium sulfate crystals based on their crystal quality and size to help the students understand what their ideal crystal might look like. For the older students, he shared with them how to utilize Excel to analyze data trends and explained the significance of the information they can provide.

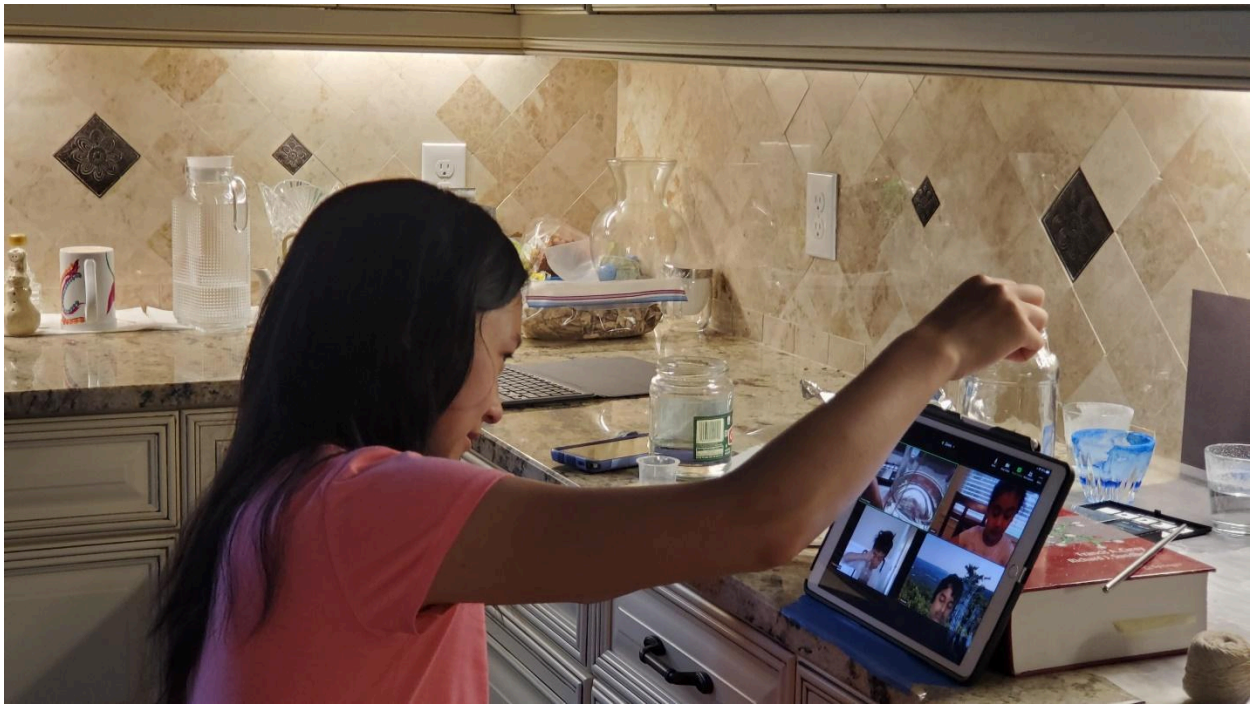
Arya Oak taught students the scientific principles of crystallography, the difference between inorganic, organic, and macromolecular crystals, and how DNA crystals can be used for X-ray diffraction and structure determination, as well as other intricacies in crystallography. She also taught the students that for an ideal salt crystal, students should be looking for a large, clear, and very faceted crystal. She also merged information across the sessions by teaching the students the ideal saturation for solutions based on their solution makeup (i.e., inorganic, organic, macromolecular molecules), teaching the importance of crystallization in the profession field, such as structure determination and the development of therapeutic medicine.

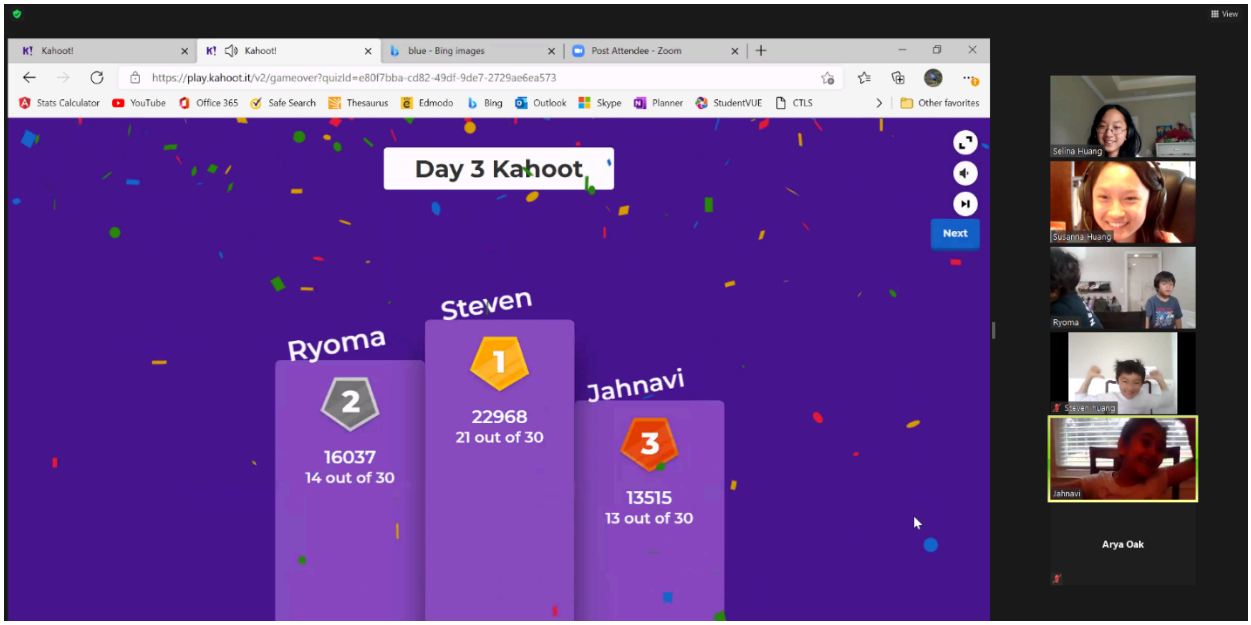
Selina Huang held sessions that showcased videos that depicted what Arya Oak taught in her session, providing students with some more visuals to internalize what Arya taught, and Selina Huang also held fun review sessions that covered all the material that the students learned that day with the other leaders. In total, Selina Huang created three Kahoot review games and personally wrote all 103 questions in the three Kahoots, with the first Kahoot being 23 questions, the second Kahoot being 30 questions, and the last and final "Kahoot Showdown" being 50 questions. In these three Kahoots, Selina Huang mixed in a variety of questions, with many of them very challenging. The students were persistent and very enthusiastic about the review games.

As a team, we put in much effort to make the 2021 STARS Crystal-Growing Summer Camp come to life. Susanna Huang designed the flyer and sent it out to local students and the students who previously registered for the 2021 Timber Ridge Crystal-Growing Competition. She managed all the emails and made the 2021 STARS Summer Camp Crystal Journal that the summer camp students would use. The STARS Team as a whole, prepared relentlessly for the summer camp, with Selina making enormous Kahoots and searching the web for the best videos to explain scientific topics for students, with Achyutan preparing teaching-plans and fun activities for the students, with Susanna preparing and testing the experiments she would teach to students ahead of time, and with Arya researching about the scientific topics herself, before creating the presentations to explain the complex topics to the students in an easily understandable way, with Arya sometimes continuing to make preparations even late into the evening.

As STARS Team, we see the beauty in crystallography, its simplicity, its complexity. We see its significance and key role in structural biology. We see the importance to spread the excitement to younger generations, for we see its promising horizons, awaiting to be explored.

This is STARS Team, inspiring others and spurring creativity, kindling the spirit of scientific exploration.




Kahoot!
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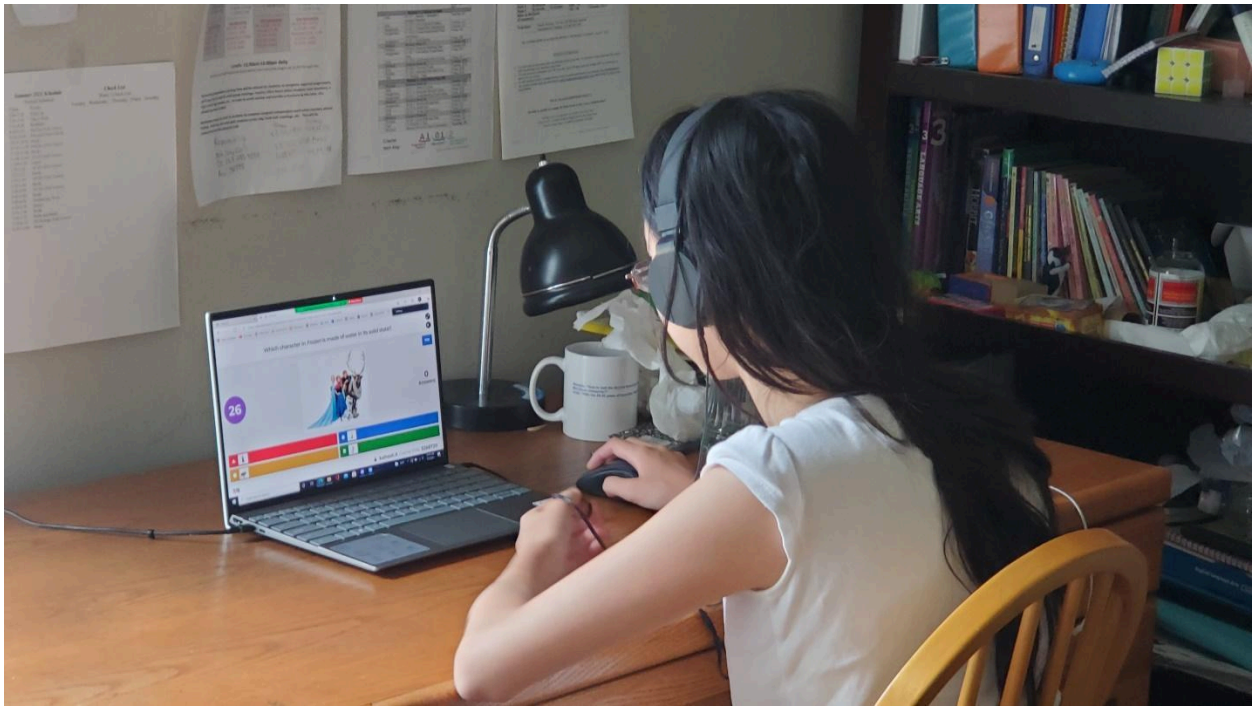
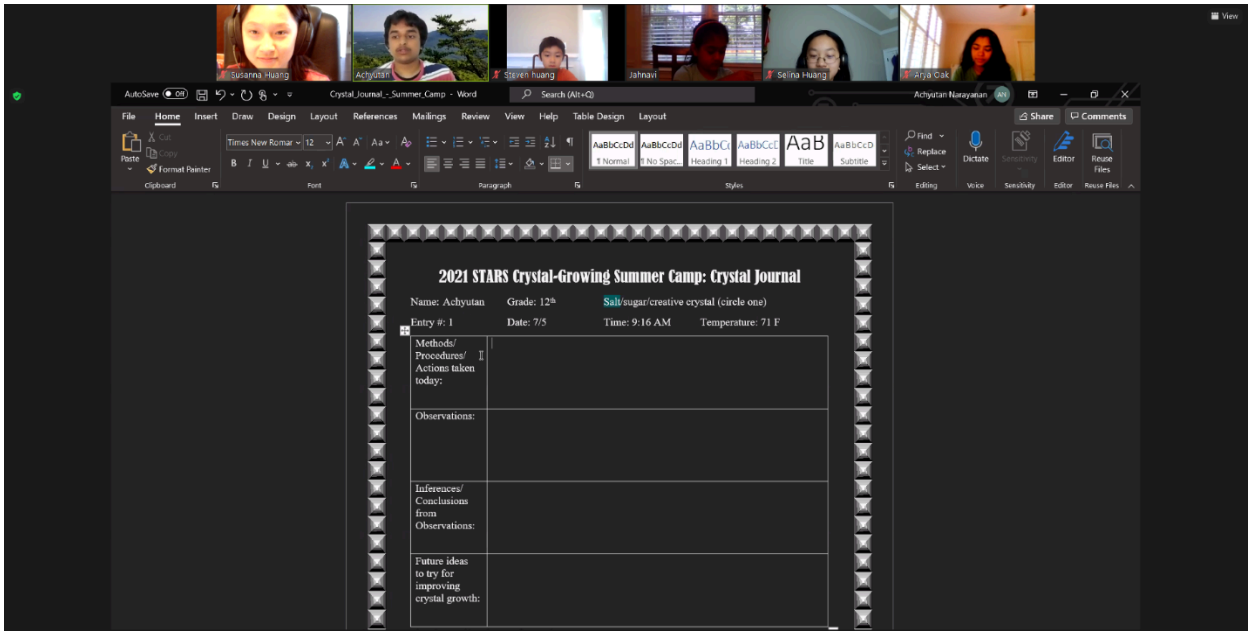
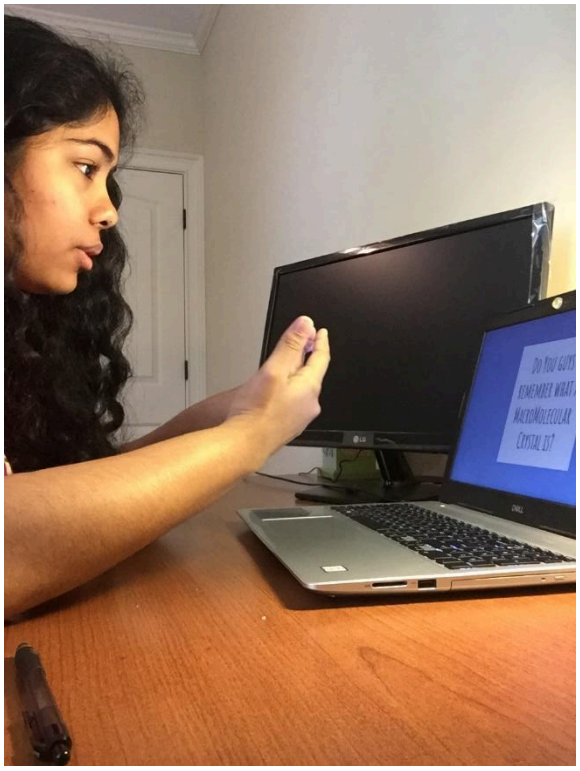
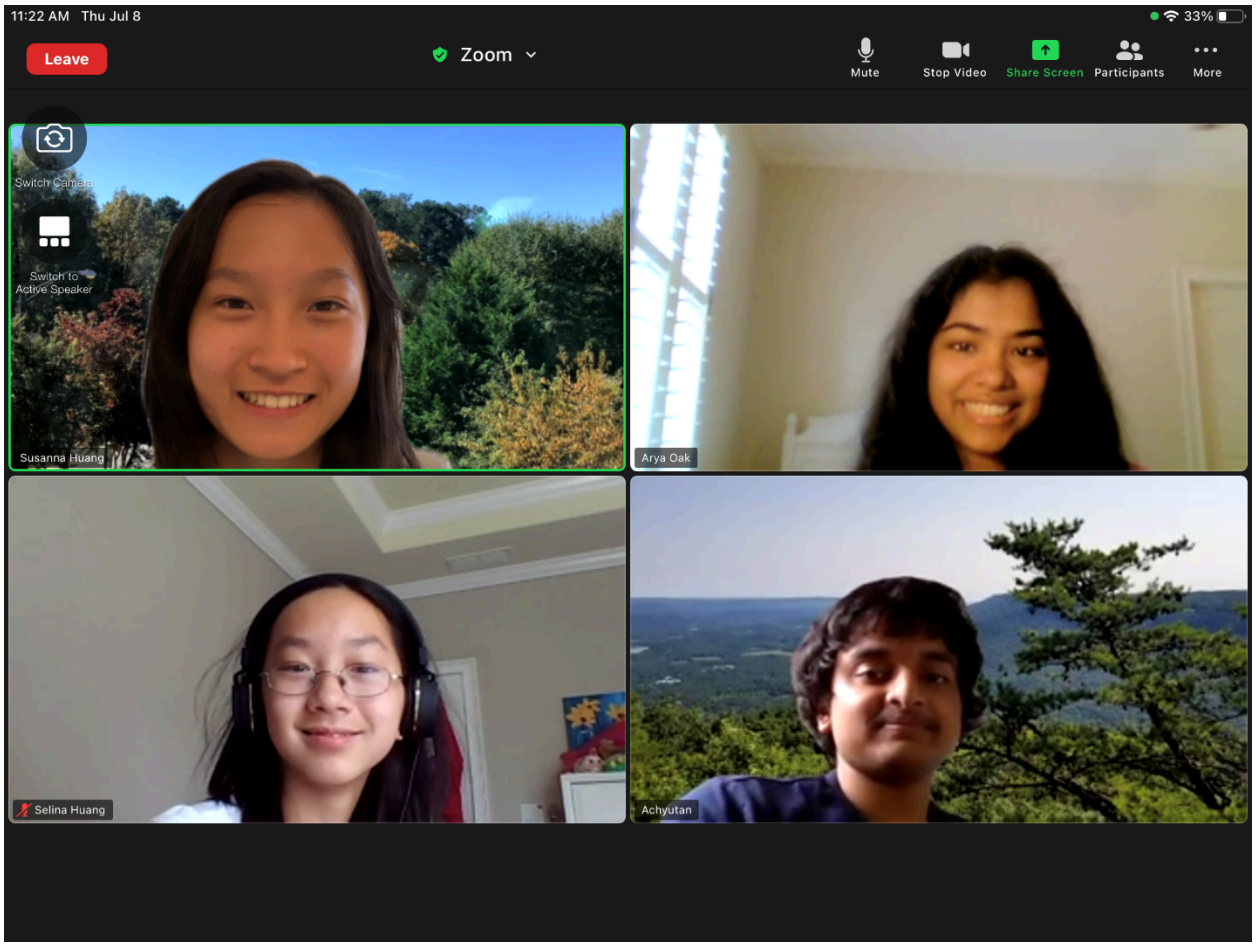
Day 3 Kahoot
Next
Ryoma
2
16037
14 out of 30
Steven
1
22968
21 out of 30
Jahnavi
3
13515
13 out of 30
Selina Huang
Susanna Huang
Ryoma
Steven Huang
Jahnavi
Arya Oak




Susanna Huang
Achyutan
Steven Huang
Jahnavi
Selina Huang
Arya Cak
Crystal_Journal_-_Summer_Camp - Word
Achyutan Narayanan
2021 STARS Crystal-Growing Summer Camp: Crystal Journal
Name: Achyutan
Grade: 12th
Salt/sugar/creative crystal (circle one)
Entry #: 1
Date: 7/5
Time: 9:16 AM
Temperature: 71 F
Methods/ Procedures/ Actions taken today:
Observations:
Inferences/ Conclusions from Observations:
Future ideas to try for improving crystal growth:




11:22 AM Thu Jul 8
33%
Leave
Zoom
Mute
Stop Video
Share Screen
Participants
More
Switch Camera
Switch to Active Speaker
Susanna Huang
Arya Oak
Selina Huang
Achyutan

Service Hours calculation:

Teaching at the Summer Camp over all four days (four hours each day):

Susanna Huang (16 hours); Arya Oak (16 hours); Selina Huang (16 hours); Achyutan Narayanan (16 hours)

Preparing the summer camp lessons over all four days (four hours each day):

Susanna Huang (16 hours); Arya Oak (16 hours); Selina Huang (16 hours); Achyutan Narayanan (16 hours)

Pre-preparations for the Summer Camp (making the flyer and managing the emails):

Susanna Huang (2 hours)

Total Service Hours for hosting the 2021 STARS Crystal-Growing Summer Camp

Susanna Huang (34 hours); Arya Oak (32 hours); Selina Huang (32 hours); Achyutan Narayanan (32 hours)

Reported by Susanna Huang

If the above may be correct, please sign below:

_____ _____

Walton STARS Teacher Sponsor Date