2024 STARS Crystal-Growing Summer Camp Report

Introduction and Contextualization

Below follows the introduction and contextualization of the event, as reported by Susanna.

STARS, Structural Nucleic Acid Anticancer Research Society, is a student nonprofit organization, and the mission of STARS is to deliver engaging and empowering crystal-growing and crystallography research experiences to K-12th and college students.

In the last three years STARS has hosted nine different events and programs, such as crystal-growing competitions, summer camps, and crystallography workshops, serving 350+ student participants cumulatively.

With regards to crystal-growing summer camps specifically, STARS hosted previous annual crystal-growing summer camps for grade school students specifically in 2021 and 2022. With the creation of the collegiate branch of STARS and the success of the three STARS crystallography workshops in the spring 2024 semester, STARS was inspired to once again host its annual crystal-growing summer camp this year to once again share with younger students the importance and significance of crystallography and structural biology.

Originally it was planned that copper sulfate crystals would be used for the older student grade division while potassium sulfate crystals would be used for the younger student grade division. However, in the middle of event preparations, it was noted that growing these crystals may be difficult, especially since these students would be working on these projects at their homes. Because of the possible safety hazards associated with these chemicals, and especially in the home environment, the crystal-growing solutes were replaced with the traditionally used solutes of the 2021 and the 2022 crystal-growing summer camps: regular table salt (NaCl) and sugar.

2024 STARS Crystal-Growing Summer Camp for K-12th grade students:

Below discusses what the event was about, what experiments were set up for the event, the schedule of the program, and what STARS members and volunteers were present, as reported by Addie:

The goal of the STARS Crystal-Growing Summer Camp was to provide enjoyable and insightful hands-on crystal-growing experiences to K-12th students. Members of the STARS at Walton Highschool and STARS at Georgia Tech club branches led the four-day summer camp that was separated into four 40-minute sections each day, with a 20-minute break between each section. The camp was held online from July 1st-4th. The students in K-5th grade were taught in separate

zoom sessions from the students in 6^{th}-12^{th} grade, to allow the depth and difficulty of lectures to be tailored towards the audience.

As follows was the general event schedule:

7:50-8:00am – Attendance

8:00-8:40am – Crystal-Growing Session

- Mirah and Selina demonstrated how to grow table salt and sugar crystals and virtually assisted the students in growing their own crystals.

9:00-9:40am – Crystal Journal Session

- Addie led students in completing their crystal-growing journals, which allowed students to reflect on the experiment just performed, and practice scientific writing/discussion.

10:00-10:40am – Theory and concepts of Crystallography Session

- Maya, Siffah, and Susanna gave presentations on the foundational scientific principles and the broad applications of crystal-growing/crystallography. Each lecture was connected to the crystal-growing done that day.

11:00-11:40am – Kahoot review game session

- Siffah led Kahoots reviewing the topics covered in the lecture from that day.

Students in K-5^{th} grade followed this schedule for all four days of the camp. Students in 6^{th}-12th grade rotated through the same sessions in a different order, with the lecture and Kahoot sessions being held before the crystal-growing and journal sessions. This rearrangement of the schedule allowed the students to have the same instructor/instructors for each session, making the sessions flow smoothly and efficiently. In addition, it allowed the older students to be separated from the younger students so that they could receive more challenging and rigorous material.

Summer Camp: Planning and preparing for the program

Backend preparation:

As reported by Susanna:

The summer program sign-up information needed to be prepared. The Google sign-up and waiver forms were prepared by Susanna. The sign-up Google form included information, such as the student signing up, the parent of the student, the related information about the student, the waiver forms for the program, the $10 registration fee, and the confirmation of the parent's pickup

of the crystal-growing kit. Additionally, an event flyer advertising the summer camp program was created by Caty.

Together, the Event fliers (one for each grade division) and the sign-up link were sent out to two WeChat messaging groups as well as sent to other possible friends and/or connections. After students began signing up and the STARS volunteers for the summer camp were confirmed, the STARS legal adult volunteers who were to teach the student participants had to pass all four requirements: (1) Undergo a pre-screening interview and be clear, (2) undergo a background check and be clear, (3) sign and submit the Conduct Agreement form, (4) have a meeting or watch a recording to learn about how to deal with students in difficult situations. Only STARS adult volunteers who passed all four requirements were allowed to teach and interact with the students. Soon, a Welcome Meeting was prepared for the students and the parents by Susanna, and the contents of a summative event flyer produced by Caty was explained to the parents. The Crystal Journal for the summer camp was revamped by Andrew to include guiding instructions on the steps for each section of the Crystal Journal. Maya created introduction and closing emails for the whole summer camp program, while Andrew created daily inspirational emails for the summer camp participants, and while Susanna prepared the emails welcoming each individual student participant and their parent who signed up as well as the email leading up to the Welcome Meeting. Now Susanna prepared the two grade division Zoom links, and because sugar crystals were also explored in this summer camp, Sara performed test-runs on the growth of sugar crystals for growing large rock candy, and she also prepared procedures that could also be used for the summer camp. Before the summer camp week, each STARS volunteer instructor was assigned certain sections to present to the students, so each instructor prepared teaching and interactive materials for these students. During these sessions, Susanna took screen shots of the instructors teaching and of the students listening and paying attention. After the program began drawing to a close, Susanna prepared both the crystal-growing competition form and the survey feedback form. The crystal-growing instructors were able to guide the students through the submission process. Maya was able to include the survey feedback form in her closing email.

Live Crystal-Growing Session and preparations (K-5th grade division):

As reported by Mirah:

Mirah prepared a PowerPoint with procedure for the salt crystals that she led the K-5th grade students though growing. She also prepared materials to create kits for the students to have so they could grow crystals during the camp. The kits included: Water, a 50mL beaker which was purchased by Susanna from Amazon, a disposable spoon, paper towels, paper bags, and stickers (both to seal the bags and for the camper to have). Mirah created both types of stickers using Adobe Creative Cloud applications and printed out the designs on sticker paper. She used her Cricut Express to cut out the stickers individually. Due to the change in the type of crystals being grown the seed crystals and bags of alum were not used.

Each morning, she marked attendance for the students who joined the Zoom session. She then led the students through the crystal growing procedure for that day. The first two days of the camp this session was used to teach students how to set up their salt solutions, decant them, and add highlighter ink to them. The third day of camp was devoted to creating a sugar crystal solution and setting up the string or chopstick for the crystals to grow on using the procedure created by Sara. On day four Mirah led the students through photographing their crystals or salt solutions in order to submit them to the Crystal Growing Competition.

There were some problems that were observed with the salt solutions. Likely due to accidental undersaturation, there were no seed crystals after the first day. Students instead used more salt as seed crystals. However, students were still unable to grow salt crystals by the end of the camp. Though they took longer than the camp to grow, the sugar crystals were very successful and very delicious.

After each day Mirah sent out an email to the students and parents detailing the materials that were needed for the next day's camp.

Live Crystal-Growing Session and preparations (6th-12th grade division):

As reported by Selina:

Selina prepared a presentation and step-by-step instructions on how to grow the salt crystals with the 6-12th students. She also helped to finalize the crystals growing kits for all participants of the summer camp by adding the 50mL beakers STARS bought off Amazon and placing the STARS stickers to seal the bag closed. After all the kits were assembled, she met up with the participants of the camp at East Cobb Park at 6:00 p.m. on both Saturday, June 29th, 2024, and Sunday, June 30th, 2024, to pass out the crystal kits. As mentioned by Mirah, the kits included water, a 50 mL cup, a spoon (or chopstick), a coffee filter, a paper bag, and some STARS stickers.

During the summer camp, Selina would take attendance and lead the students through growing their salt crystals. Concise procedures were written out for the students to read and follow along. Procedures for each of the day is listed below:

Day 1 (Salt Crytal Day 1):

1. Fill the plastic measuring cup with distilled, deionized water (can be substituted with regular water) up to the fill line of the 50 mL beaker
2. Transfer water into a microwavable container and microwave for 1 minute
3. Add the 18g (10 mL) of table salt into microwavable container and mix well
4. Continuously mix for 5 to 10 minutes to ensure the solution is homogenized
5. Leave the solution to rest

Day 2 (Glow-in-the-Dark Day):

1. After solution cools and equilibrates, place back into plastic cup (decant the solution if crystals have already formed at the bottom)
2. Place a paper or coffee filter on top of the original plastic cup and dump solution into the cup, effectively removing the left-over crystals and sediment
3. Break open a highlighter and remove the highlighter core
4. Squeeze out all the ink in the highlighter core
5. Look for a seed crystal from the removed sediment (if there is none, add a pinch of salt to induce crystal growth instead)
6. Delicately add the seed crystal

Day 3 (Sugar Crystal Day):

1. Fill the plastic measuring cup with distilled, deionized water (can be substituted with regular water) up to the fill line of the 50 mL beaker
2. Transfer water into a microwavable container and microwave for 1 minute
3. Add the 100g (120 mL) of sugar into microwavable container and mix well
4. Continuously mix for 5 to 10 minutes to ensure the solution is homogenized
5. Hang a string in your solution (make sure it does not touch the walls or floor of your container)
6. Leave the solution to rest

Day 4 (Salt Crystal Day 2):

1. Carefully remove your single seed crystal from your salt solution
2. Dry it and place it in a safe place
3. Take the specified pictures listed on the form (picture on a scale, picture on a notebook paper, picture next to the ruler)

While Selina was able to grow a single, large salt crystal, some of the 6-12th students did not observe large enough crystal growth. This could be due to students accidentally mis-preparing their salt solutions and making them more undersaturated. Many students also observed flakes of salt at the bottom of their cups. This could be caused by students accidentally disturbing the solution while it was in its supersaturated state and cause the salt to precipitate out of the solution.

Selina would also send out an email by the end of the camp that included the session procedures taken the day of as well as the materials to bring for the session of the next day.

Crystal Journal Session and preparation:

As reported by Addie:

The Crystal Journal session and preparation duties were assigned to Andrew and Addie. On June 25th, Andrew uploaded the updated and revamped version of the crystal journal template to the 2024 STARS crystals growing summer camp folder. In addition, Andrew sent a pdf version of the document to Susanna and Addie for review the same day.

Once the document was reviewed and finalized, Addie made a copy of the document for each day of the summer camp and added pictures and additional notes to assist during the teaching session.

On the first day of the summer camp, July 1st, Addie taught the K-5th graders from 9:00-9:40am and the 6th-12th graders from 11-11:40am. Mirah and Selina assisted during both sessions. Addie taught students in both age groups how to set up their crystal journals, write a detailed procedure, and share observations. In addition, she introduced the students to the claim-evidence-reasoning analysis structure, the future ideas section, and the process of drawing technical crystal structures. At the end of day one, all students had Entry #1 for the table salt crystal.

On day two, July 2nd, Addie taught during the same time blocks with Siffah assisting in both sections. Despite having little success with growing salt crystals, Addie assisted students with writing a detailed procedure from that day's experiment and encouraged them to make observations about their highlighter solutions. The students practiced using claim-evidence-reasoning analysis with a structured walk-through in the K-5th section and individual practice with a group discussion in the 6th-12th section. Next, students thought about possible improvements they could make to the previous day's procedures to improve their seed crystal results in the future. Finally, students practiced drawing technical crystal structures using either their own seed crystals as reference, or a magnified image of a grain of salt if they were unable to grow a seed crystal. At the end of day two, all students had Entry #2 for the table salt crystal.

On day three, July 3rd, Addie taught during the same time blocks with Susanna assisting in both sections. Addie taught the students how to set up their first notebook entry for the sugar crystals using a similar process as described in day one. For this section however, more individual thoughts and group discussions were encouraged. After the journal sections were completed, the final step of the experiment was able to be completed. Students had to wait for their sugar water solutions to cool before suspending their sugar seed crystals, so we walked through this step together after the journal entry. There was still some time remaining in the 6th-12th section after suspending the crystals, so Susanna gave some information about the upcoming crystal competition submissions. At the end of day three, all students had Entry #1 for the sugar crystal.

On day 4, July 4th, Addie taught the K-5th graders from 9:00-9:40am and the 6th-12th graders from 10-10:40am. Mirah assisted during the K-5th section and Siffah assisted during the 6th-12th section. Addie walked through the last journal entry with both groups, making final observations

about their salt crystals and reflecting on future experimental improvements. Once the final journal entries were finished, Addie walked the students through the Crystal Growing Competition submission and assisted students with scanning if needed. At the end of day four, all students had Entry #3 for the aluminum potassium sulfate crystal and submitted their crystals to the STARS Crystal Growing Competition.

Lections on theories and concepts of crystallography Susanna:

As reported by Susanna:

Each day during the crystallography lecture section, the different crystallographic concepts, at increasing difficulty level, were introduced to students.

On the first day, Salt Crystal Day, Maya taught the students the key information about crystals and solutions, namely (1) the definition of a crystal, (2) the properties of crystals, (3) the three types of solutions (saturated, supersaturated, and undersaturated), (4) amorphous vs crystalline solids, and (5) the three types of crystals (inorganic, organic, and macromolecular). The lecture was given in a presentation format. With additional time, she reviewed with the students the topics she taught her students.

On the second day, Glow In the Dark Crystal Day, Siffah taught the students the key information about how certain compounds in highlighter inks can glow, and the scientific reason of why they glow. He taught: (1) introduction to electromagnetic spectrum, (2) introduction to fluorescence, absorbance, and emission, (3) introduction of conjugation and rings in chemical compounds, (4) introduction to p-orbitals and delocalized electrons and aromaticity, (5) introduction of nucleation, or the crystal-growth initiation site.

On the third day, Sugar Crystal Day, Susanna taught the students about sugar and organic crystals, namely (1) a review on the differences between inorganic, organic, and macromolecular crystals, (2) introduction of how salt crystals can be dissolved and how that compares with how sugar crystals can also be dissolved by water molecules, (3) introduction to the 3D structures of salt crystals and sugar crystals as well as how they affect the packing of these molecules, (4) introduction to the seven crystal systems, the 14 Bravais Lattices, and the 230 space groups, and (5) a hands-on introduction to the usage of the PDB to find the space group of crystal structures deposited on the PDB.

On the fourth day, Crystal Submission Day and DNA Crystal Day (which was also 4th of July), Susanna taught the students the importance of DNA crystals and specifically how they are applicable to therapeutics today, namely through (1) the explanation of the Central Dogma, (2) the introduction of the Structure = Function concept, (3) example of how structure determination of macromolecules can lead to therapeutic drug discoveries and Nobel Prize recognitions, (4) the importance of growing DNA crystals for therapeutic discoveries as well as its crystal growth

challenges, and (5) the usefulness of the selenium modification of DNA technique for improving its crystallizability, its packing order, its crystal growth rate, and its crystal growth size.

Kahoot review game sessions:

As reported by Siffah:

The event included having the attendees play a Kahoot game after their lecture session for the day. This was for the sake of review in the form of friendly competition, which motivated the students to participate. There were four Kahoot games over the course of the event. Siffah was responsible for creating the Kahoot games for days one and two, with the day one game reviewing the introduction to crystals/inorganic crystals lecture, and the day two game reviewing the introduction to fluorescence/glow in the dark crystals lecture. Sara was responsible for creating the Kahoot games for days three and four, with the day three game reviewing the introduction to organic & macromolecular crystals lecture, and the day four game was a "Mega Kahoot", which covered the material taught on every previous day.

On the first day of the event, the Kahoot game did not extend over the entire 40 minutes of allotted time, and as such we pivoted to playing an online web game called "skribl.io", which is a game in which one player draws a picture and the rest of the players have to accurately guess what the picture is depicting. The game allowed us to use custom words in our play session, and so the game was played using vocabulary words/key terms discussed in the lecture for that day. The remaining Kahoots were then edited to ensure that for the remainder of the event, they would use up all of the allotted time for these sessions.

These games were carried out as a Kahoot normally would be, only with the occasional break for STARS members to explain any questions/concepts that the attendees seemed to struggle with, as well as to encourage student participation by asking them to explain a question/concept themselves. This strategy helped the students retain the material that they learned.

Feedback from the event

Below are the cumulative feedback from the event surveys as reported by Siffah.

A post-event survey was conducted, sent out July 4th, 2024, via email. Survey inquiries included name, email, event enjoyment, likelihood of participating in another event, likelihood of recommending the event to a friend, interest in the STARS organization, and recommendations on how to improve future events. There were 2 responses to the survey.

Responses to multiple 10-point Likert scale questions are found in the appendix (Table 1). Average responses were very positive regarding how engaging & enjoyable the event was, as well as interest in learning more about STARS. On top of this, 100% of respondents stated that they were very likely to recommend this event to a friend. Additionally, there were short answer questions participants filled out (seen in appendix, Table 2).

Of those that responded when asked if the participants enjoyed the event, the response was "yes", stating that there was a lot to learn from the event. The second question asked what the participants' favorite experiences/moments were, garnering the response of it being the Kahoot review games that took place after each lecture. Respondents recommended for future events that the material covered be adjusted to accommodate younger attendees, as they faced many hiccups when it came to the required writing, as well as much of the material being a bit advanced for them. These responses will be considered for future events, where the club plans to be more considerate of our younger audience to ensure they have an equally fun and interesting experience, as well as looking further into incorporating new ideas and concepts into future events.

Conclusion

As reported by Addie:

The event organizers are so thankful to the members of the STARS high school branch, members of the STARS college branch, parents of the participating students, and everyone else who made this camp possible. The goal of STARS has always been to share the experience of growing crystals with students interested in crystallography research. Thanks to everyone involved, this event was a valuable experience for K-12 students of all skill levels. The camp was offered over four days, each day consisting of four sessions: (1) Crystal-Growing Session, (2) Crystal Journal Session, (3) Theory and concepts of Crystallography Session, and (4) Kahoot review game session. The event had a great turnout with 10 students registering between the two age groups- five K-5th students and five 6th-12th students. The attendance and retention rates were also very high with 8 of the 10 students attending all 4 days, and with the other two students only missing 1 day of the camp. The STARS members who helped make this camp possible include Susanna Huang, Maya Leveille, Siffah Bonsu, Selina Huang, Mirah Lindsay, Andrew Fang, Caty Lue, Sara Hunihan, and Adelaide Kindler. This camp not only gave the participating K-12 students a great introduction to crystal-growing, but also gave the mentioned STARS members a wonderful opportunity to share their passion and excitement for crystallography.

Next Steps

As reported by Susanna:

Seeing that the summer camp was so successful in comparison to the previous STARS summer camps, which usually only had attendance of around five or six students, the STARS students were very encouraged and are planning on considering on hosting an in-person crystal-growing summer camp in the next summer. If this may be possible, the lab environment can be controlled by the STARS organization, and it will be possible for students to work on more interesting and cooler experiments, such as growing protein and DNA crystals for their experiments.

Additionally, since all the students have submitted their crystals, now the crystals will need to be judged after July 31st. Once that occurs, the winners of the competition can be recognized for their hard work and effort.

As reported by:

Susanna Huang, Adelaide Kindler, Mirah Lindsay, Selina Huang, and Siffah Bonsu

August 5, 2024

Appendix

All event materials:

- **Student attendance and Teaching schedule:** Registered students.xlsx
- Google folder with all important flyers, sign up forms, submission forms, and documents: https://drive.google.com/drive/folders/1OUm_6viWNWTVMWXefHHWRn0D9X6r8-jo?usp=drive_link
- **Welcome meeting recording: https://youtu.be/exJeR0I3dDc**
- Procedure and materials for crystal-growing (Selina and Mirah): https://gtvault-my.sharepoint.com/:w:/g/personal/shuang466_gatech_edu/Ee3VgG7rdYhOqlmOEy_fjMkBB-RQRP-FcNbMCHvpJFV1cA?e=fmlzjA
- Revamped Crystal Journal: https://drive.google.com/file/d/188Qdeoa6gyA4Cmk-l8c0CQQaohrpFSed/view?usp=sharing
- **All presentations given during the lecture sessions: All presentations given during the lecture sessions.pptx**
- **All Kahoots given during the review sessions: All Kahoots given during the STARS summer camp.docx**
- Flyer introducing the summer camp: https://drive.google.com/file/d/1zu-YyDU0ZSFBtySsK_VkuGy_RhFDGrkO/view?usp=sharing
- Survey Feedback form: https://forms.office.com/r/08U2eQkJSk
- All photos of the event: Screenshots and images from Zoom meeting.docx
- **STARS at GT Instagram page:** https://www.instagram.com/stars.anticancer.gt/

Event survey summary:

Table 1. Multiselect Survey Questions

https://forms.office.com/Pages/DesignPageV2.aspx?subpage=design&FormId=u5ghSHuuJUuLem1_MvqggwoYuzWuIJVLtoZUfbaTaLhUQ0ZUSVcwRDRDVktYVEpBWFlOWjBLV0daUy4u&Token=39eba23cb57c4658a6f87027dabb75ba

Question	Anonymous Response with iD's 1-2
On a scale of 1 to 10, how much did you enjoy the event experience?	1. 10/10 (Promoters) 2. 8/10 (Passives)
On a scale of 1 to 10, how likely would you attend another event like this one?	1. 10/10 (Promoters) 2. 10/10 (Promoters)
On a scale of 1 to 10, how interactive and engaging did you find this event to be?	1. 10/10 (Promoters) 2. 10/10 (Promoters)
On a scale of 1 to 10, how interested are you in learning more about the STARS organization?	1. 10/10 (Promoters) 2. 10/10 (Promoters)
On a scale of 1 to 10, how interested are you in learning more about the STARS at GT crystallography research club?	1. 10/10 (Promoters) 2. 10/10 (Promoters)
On a scale of 1 to 10, how likely would you recommend a friend to attend an event like this in the future?	1. 10/10 (Promoters) 2. 9/10 (Promoters)

Table 2. Short Answer Feedback Questions

Question	Anonymous iDs	Corresponding Short Answer Response
Did you enjoy attending the event? Please describe why or why not.	1-2	1. “N/A” 2. “Yes, there was a lot to learn.”
Please describe your favorite experience or moment of the event.	1-2	1. "N/A” 2. "My daughter enjoyed whenever they were on a streak with the Kahoot! And the hands on crystal growing process, like when they added the food coloring to the sugar solution.”
What are some recommendations you may have for improving similar events in the future?	1-2	1. "Appreciate all the teachers” 2. “The instructors were knowledgeable and super patient. The level was way above 3rd grade in a lot of ways. They’ll have observations to make, but for the notetaking, writing that quickly and small isn’t something they’ve encountered yet. They know about basic states of matter, but they haven’t encountered atomic theory, the periodic table, polarity, etc. Because it’s so much information it can be difficult and frustrating for them. Having them exposed to things beyond their grade level is fantastic, and I think they learned about making solutions and the scientific process in general. If it’s possible to bring the level down for the younger kids, it would help them.”
Any other comments or questions?	1-2	1. (blank) 2. We were not expecting camp to be held on a holiday, but we’re glad we could make it.

List of event attendees

Listing of the participants, their grade levels, the division they participated in. Total number of summer camp attendees: 10. As reported by Selina.

Name	Grade	Division Participated	Day 1 (07/01/2024) Attendance	Day 2 (07/02/2024) Attendance	Day 3 (07/03/2024) Attendance	Day 4 (07/04/2024) Attendance
Caelyn Lindsay	3rd	K-5th	X	X	X	X
Allison Zhang	4th	K-5th	X	X	X	
Jayden Wu	5th	K-5th	X	X	X	X
William Wu	8th	K-5th	X	X	X	X
Ty Tang	8th	6th-12th	X	X	X	X
Zeeno Tang	5th	K-5th	X	X	X	X
Anna Rose Cregeur	3rd	K-5th	X	X	X	X
Ashley Hua	8th	6th-12th	X	X	X	
Steven Huang	6th	6th-12th	X	X	X	X
Claire Hong	5th	6th-12th	X	X	X	X
Totals			10	10	10	8

List of STARS members for the summer camp

List of STARS members who contributed to the summer camp and the roles that they played. As reported by Susanna.

STARS member	Prep and closing work	Day 1	Day 2	Day 3	Day 4
Mirah Lindsay	Prepared crystal-growing kits (with STARS stickers) Prepared crystal-growing lecture material	Taught K-5th Crystal-Growing Session Wrote daily reminder emails for the materials needed for the next day	Taught K-5th Crystal-Growing Session Wrote daily reminder emails for the materials needed for the next day	Taught K-5th Crystal-Growing Session Wrote daily reminder emails for the materials needed for the next day	Taught K-5th Crystal-Growing Session Wrote daily reminder emails for the materials needed for the next day
Selina Huang	Finalized and passed out	Taught 6th-12th Crystal-	Taught 6th-12th Crystal-	Taught 6th-12th Crystal-	Taught 6th-12th Crystal-

	crystal-growing kits (at East Cobb Park) Prepared crystal-growing lecture material	Growing Session Wrote daily reminder emails for the materials needed for the next day	Growing Session Wrote daily reminder emails for the materials needed for the next day	Growing Session Wrote daily reminder emails for the materials needed for the next day	Growing Session Wrote daily reminder emails for the materials needed for the next day
Addie Kindler	Prepared daily Crystal Journal notes for her students	Taught K-5th Crystal Journal Session Taught 6th-12th Crystal Journal Session	Taught K-5th Crystal Journal Session Taught 6th-12th Crystal Journal Session	Taught K-5th Crystal Journal Session Taught 6th-12th Crystal Journal Session	Taught K-5th Crystal Journal Session Taught 6th-12th Crystal Journal Session
Maya Leveille	Prepared lecture material for Day 1 Prepared opening and closing emails for the summer camp program	Teach 6th-12th Crystallography theory session Teach K-5th Crystallography theory session			
Siffah Bonsu	Prepared Day 1 and Day 2 Kahoots Prepared lecture material for Day 2	Run 6th-12th Kahoot review session (with Skribbl.io) Run K-5th Kahoot review session (with Skribbl.io)	Teach 6th-12th Crystallography theory session Teach K-5th Crystallography theory session	Run 6th-12th Kahoot review session Run K-5th Kahoot review session	Run K-12th mega Kahoot review session
Susanna Huang	Sent individual welcome	Mange the background and take	Run 6th-12th Kahoot review session	Teach 6th-12th Crystallograph	Teach 6th-12th Crystallograph

	emails and prepared Welcome Meeting email and hosted the Welcome Meeting and gave its presentation. Prepared lecture material for Day 3 and Day 4	screen shot photos of the Zoom sessions	Run K-5th Kahoot review session	y theory session Teach K-5th Crystallography theory session	y theory session Teach K-5th Crystallography theory session
Andrew Fang	Revamped the Crystal Journal Prepared and sent out daily morning emails on interesting crystal-growing	Sent out daily morning emails	Sent out daily morning emails	Sent out daily morning emails	Sent out daily morning emails
Caty Lue	Prepare three program flyers Prepare main summative program flyer				
Sara Hunihan	Test out sugar crystal-growing procedure Wrote sugar crystal-growing procedure				

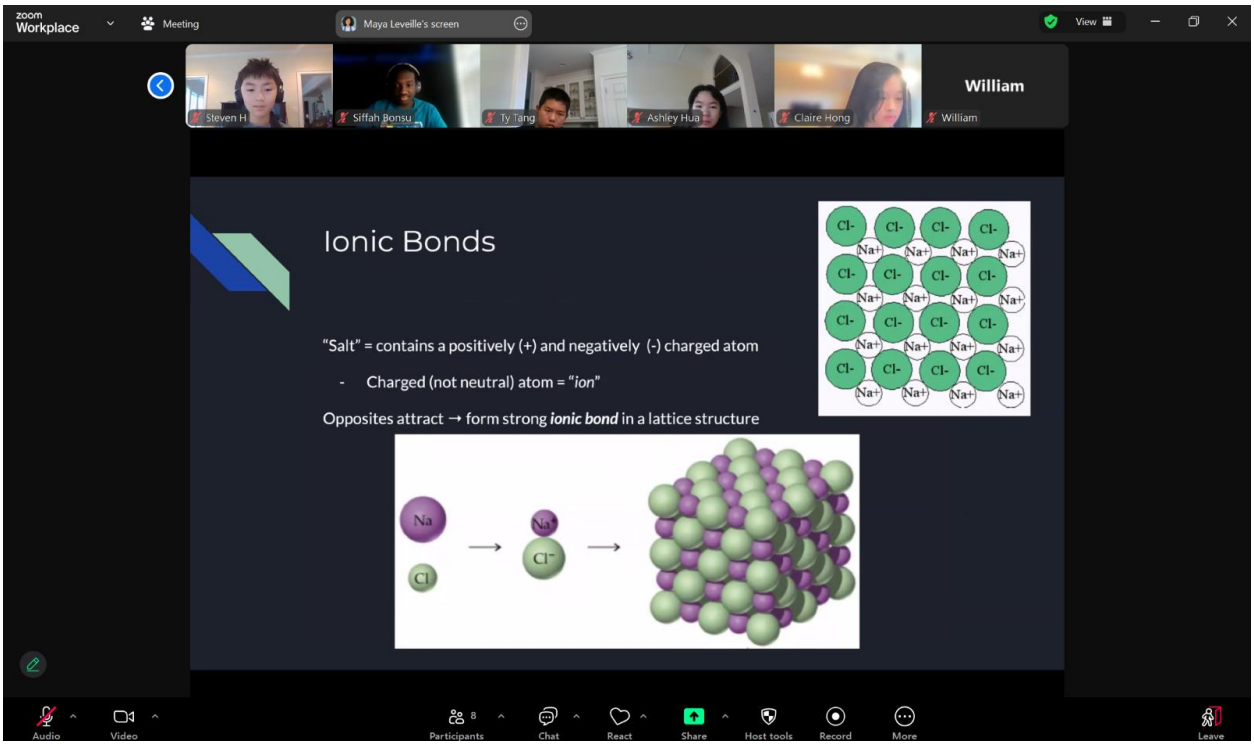
	Prepared Day 3 and Day 4 Kahoots				

Photos

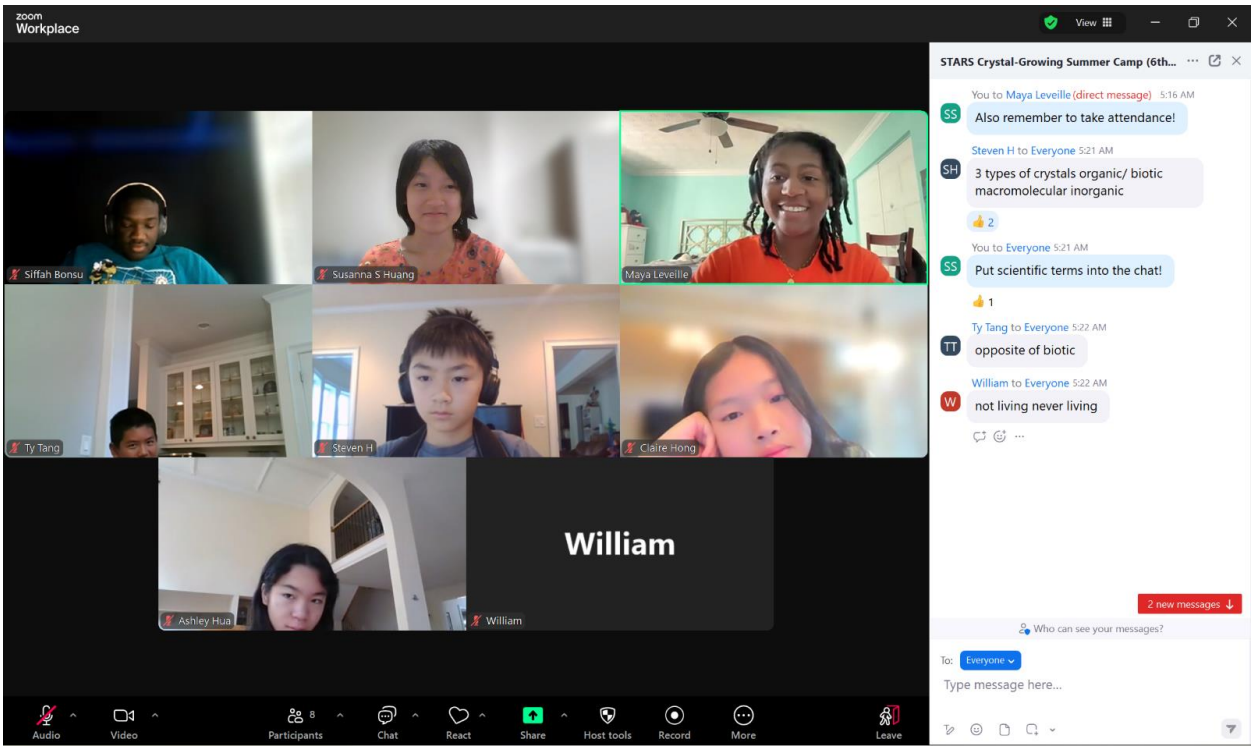
The kits prepared by Mirah and Selina were distributed to the students in East Cobb Park.

Selina distributing the kits to the families that participated in the camp on Saturday, June 29th, 2024, at 6pm.

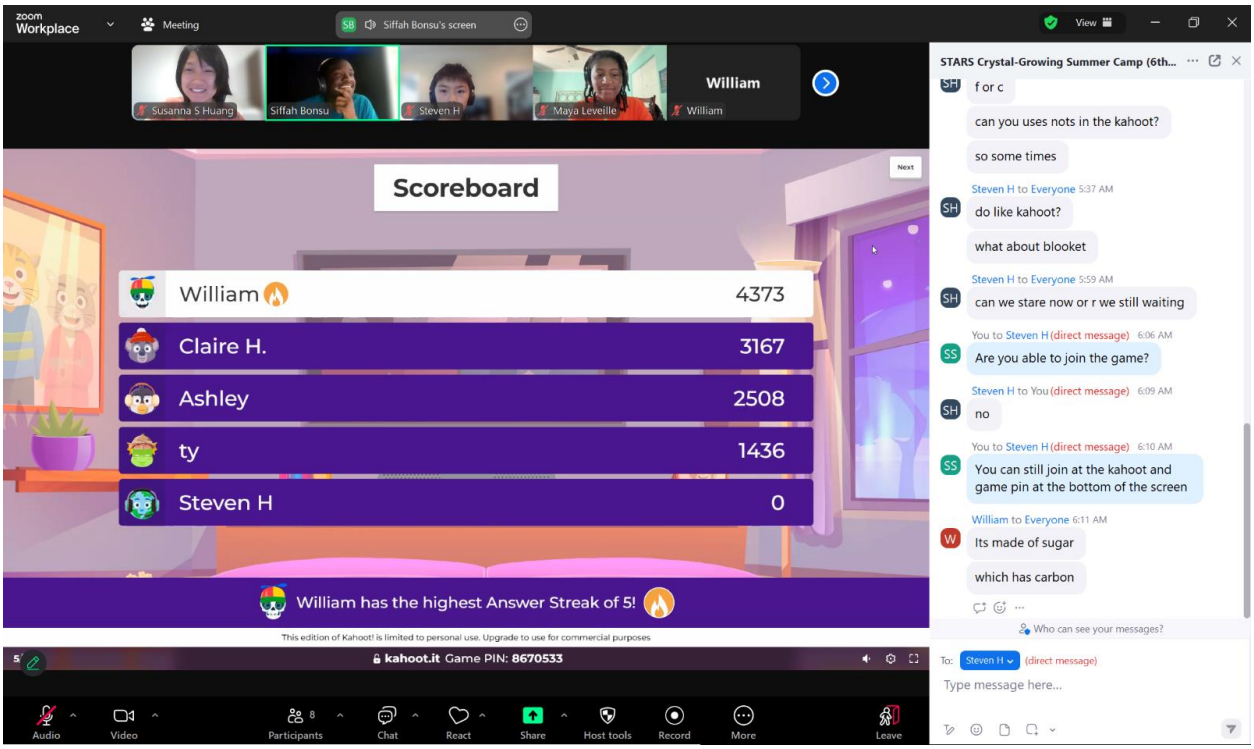
DAY 1, July 1st, 2024:



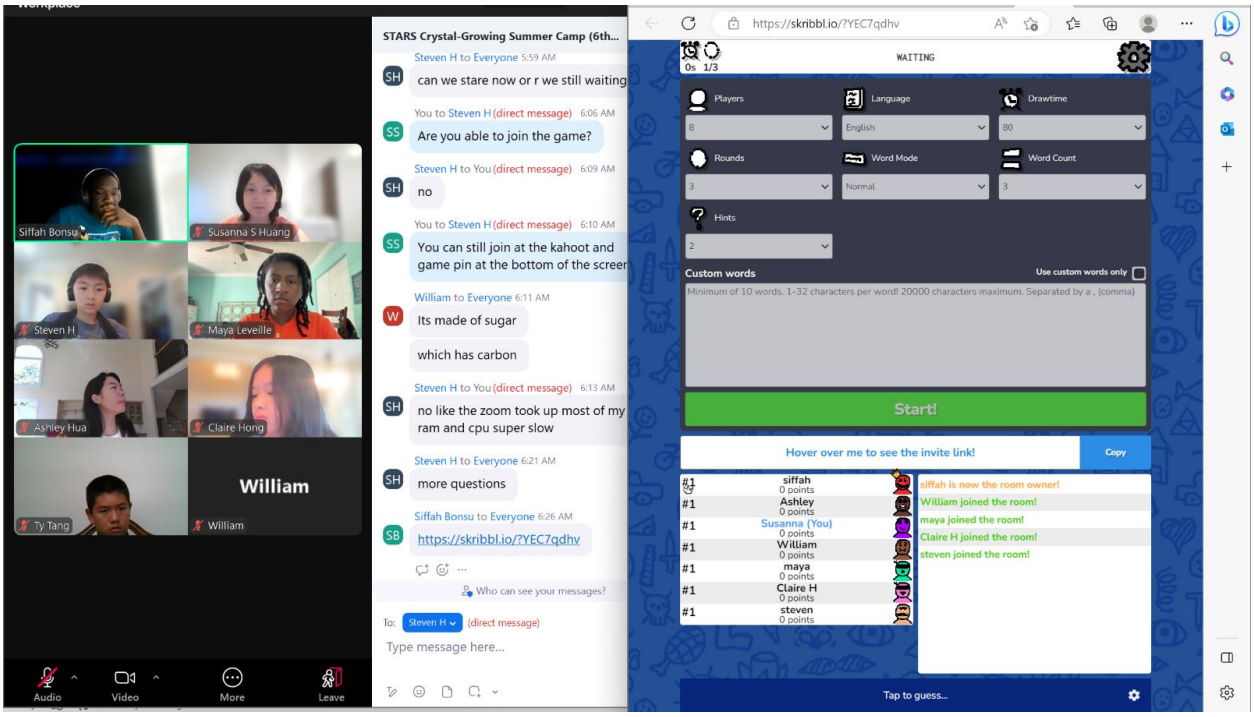
Lecture being taught to 6-12th students in their first section on day one.



Maya teaching the lecture session with the 6-12th students on day one, July 1st.

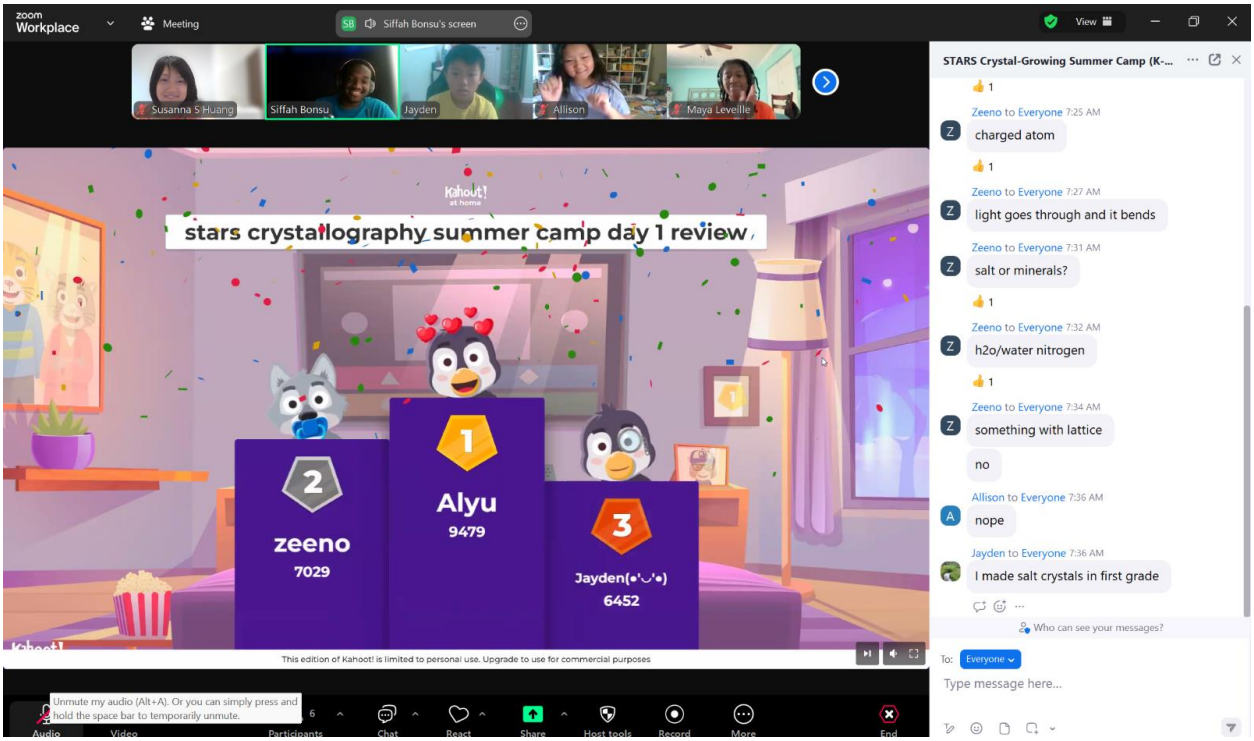


6-12th students doing a Kahoot led by Siffah on day one in session two.

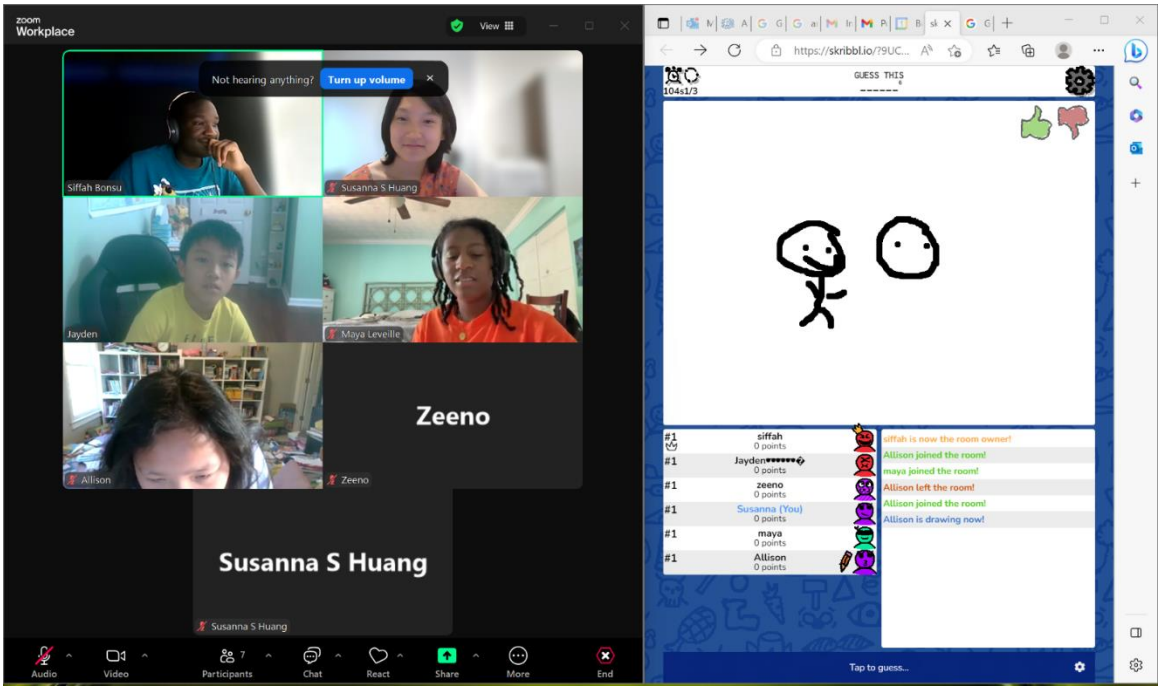


Siffah doing a Scribble.io game with the 6-12th students in session two of day one.

Maya teaching the lecture session to the K-5th students in session three of day one.

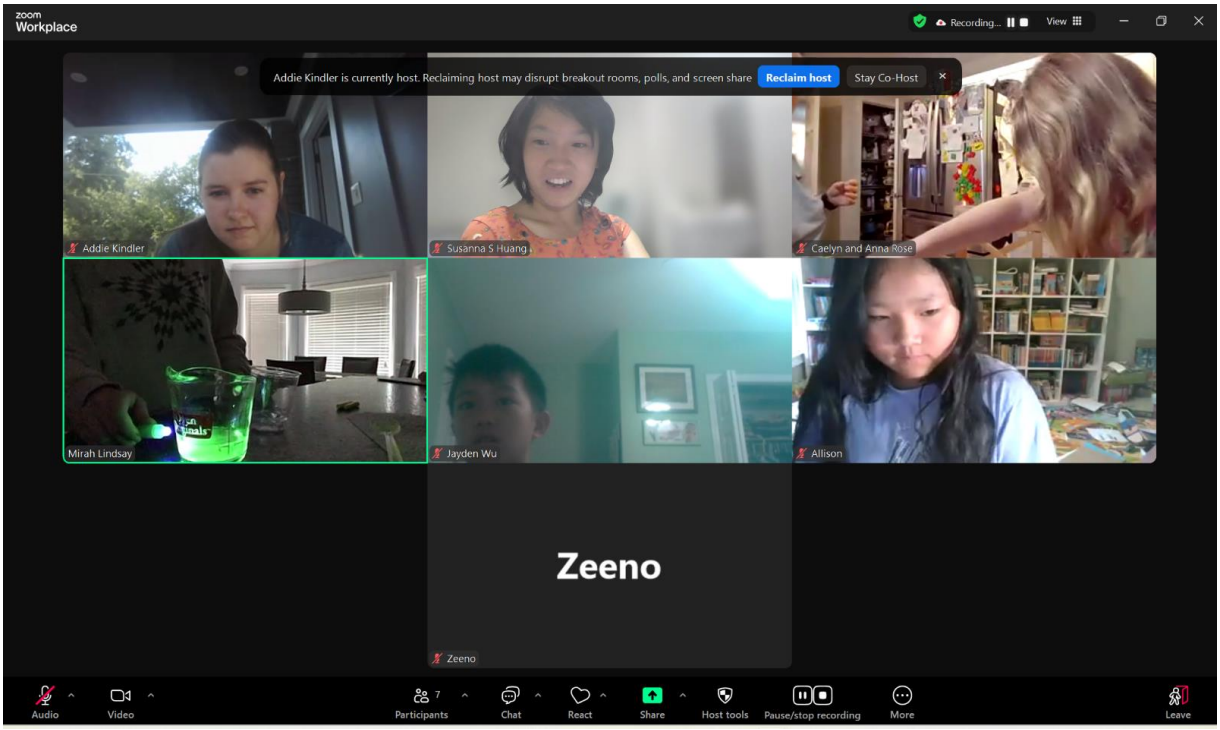


Siffah leading the K-5th students in a Kahoot in their fourth session of the first day.

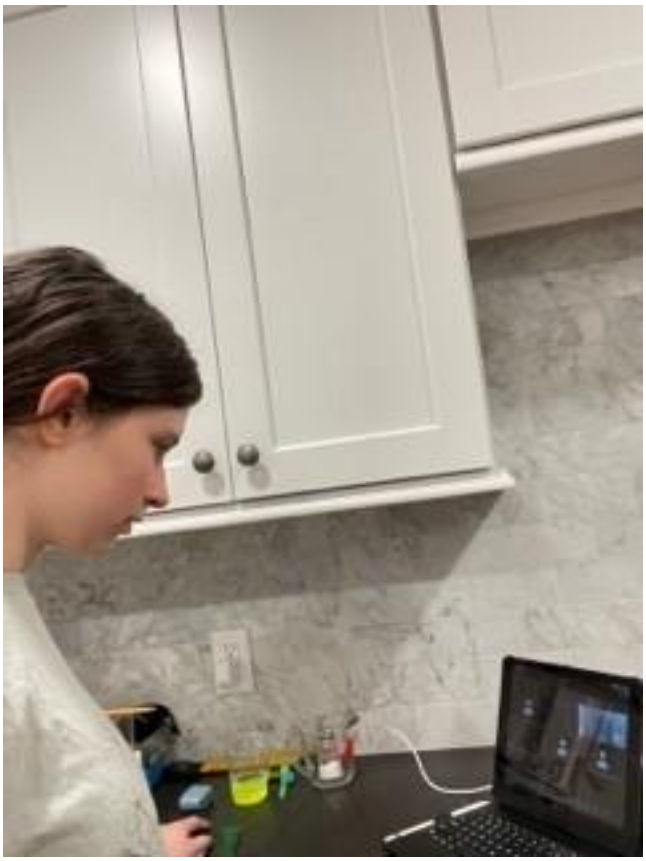


K-5th students playing a Scribble.io game, led by Siffah, after finishing a Kahoot in their fourth session of day one.

DAY 2, July 2nd, 2024:

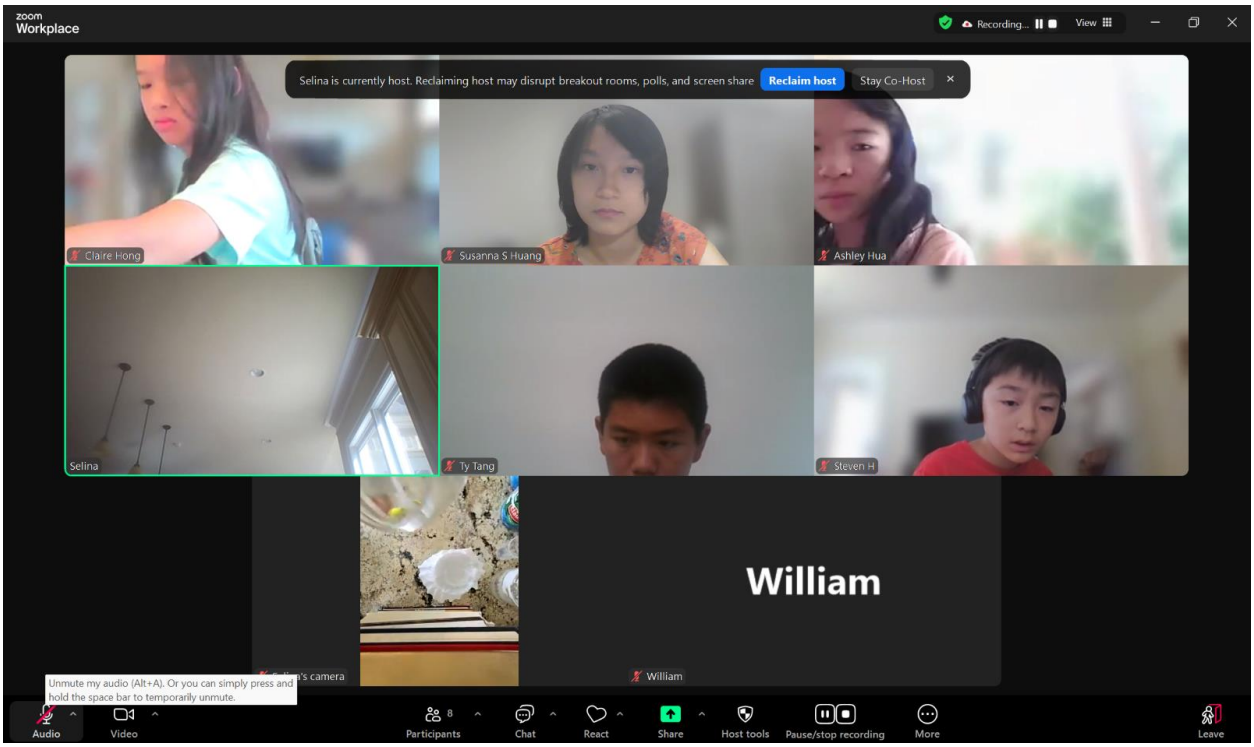


Mirah showed the K-5th students how the highlighter crystal solution fluoresces under UV light in the crystal growing session (session one) of day two.

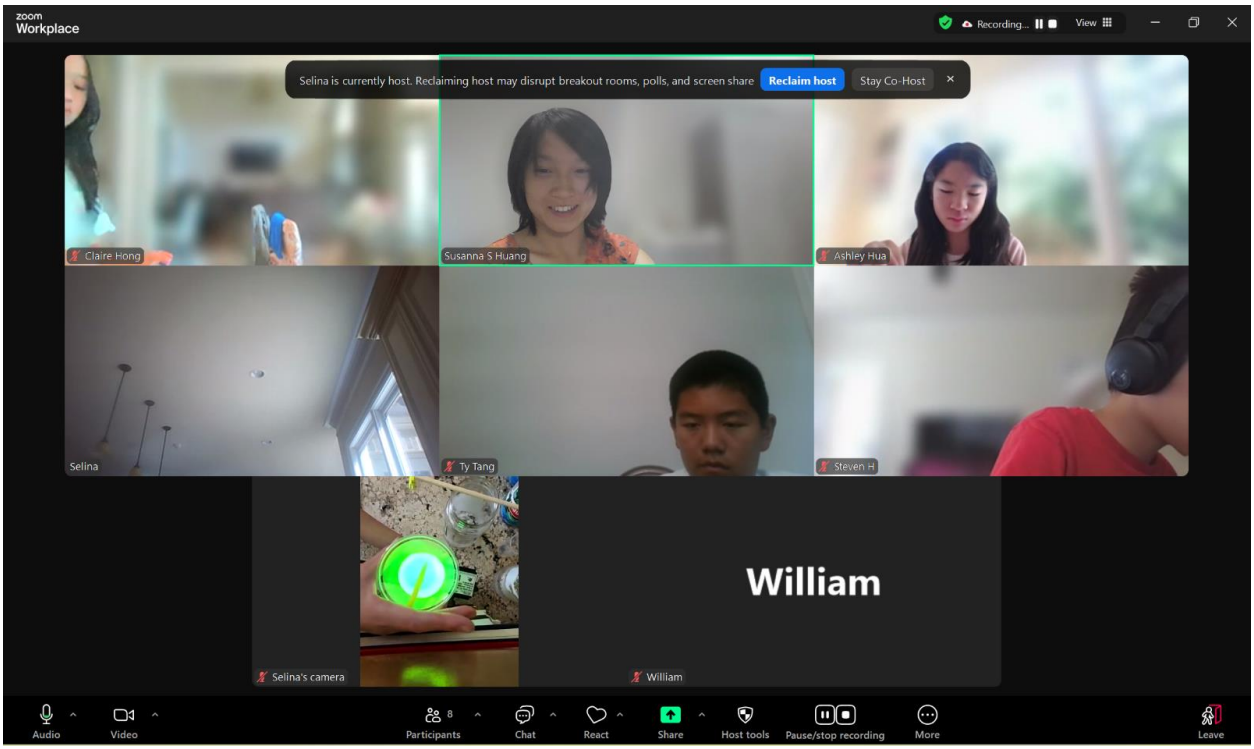


Mirah teaching the K-5th students in session one of day two.

Susanna teaching the lecture session for the 6-12th students on day two.



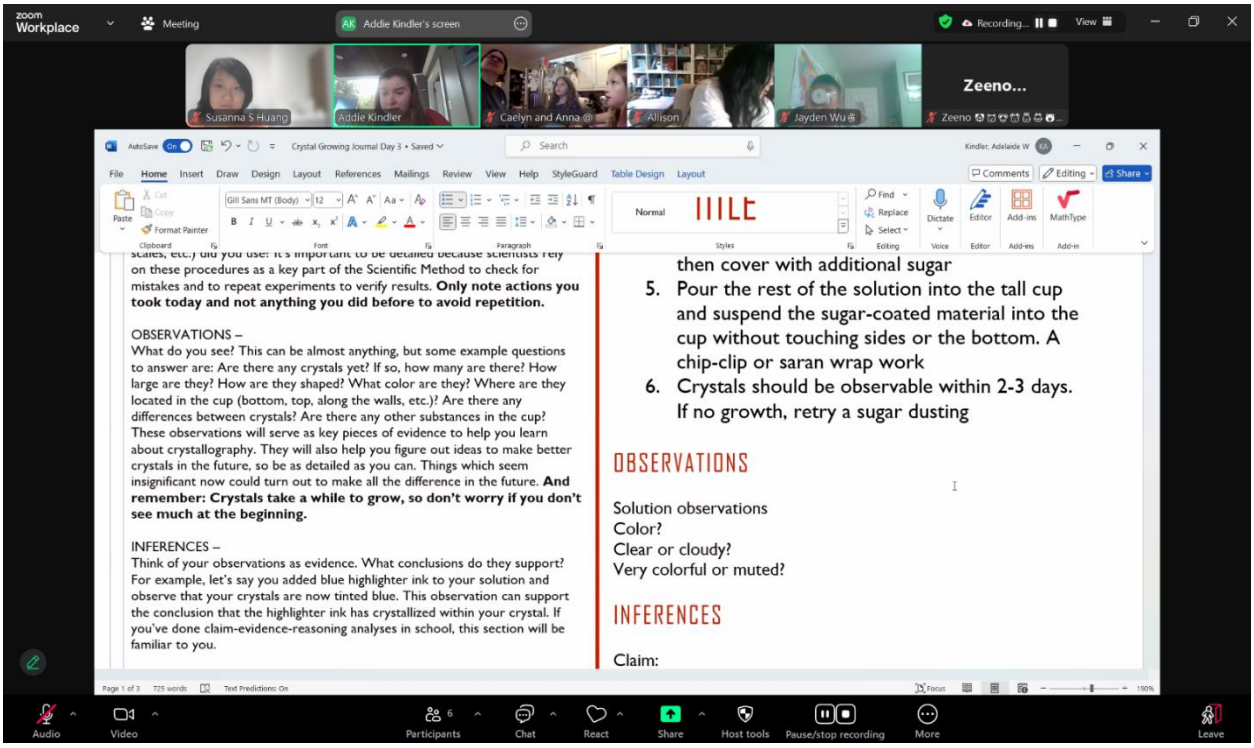
Selina teaching the 6-12th students the crystal growing session (session three) on day two.



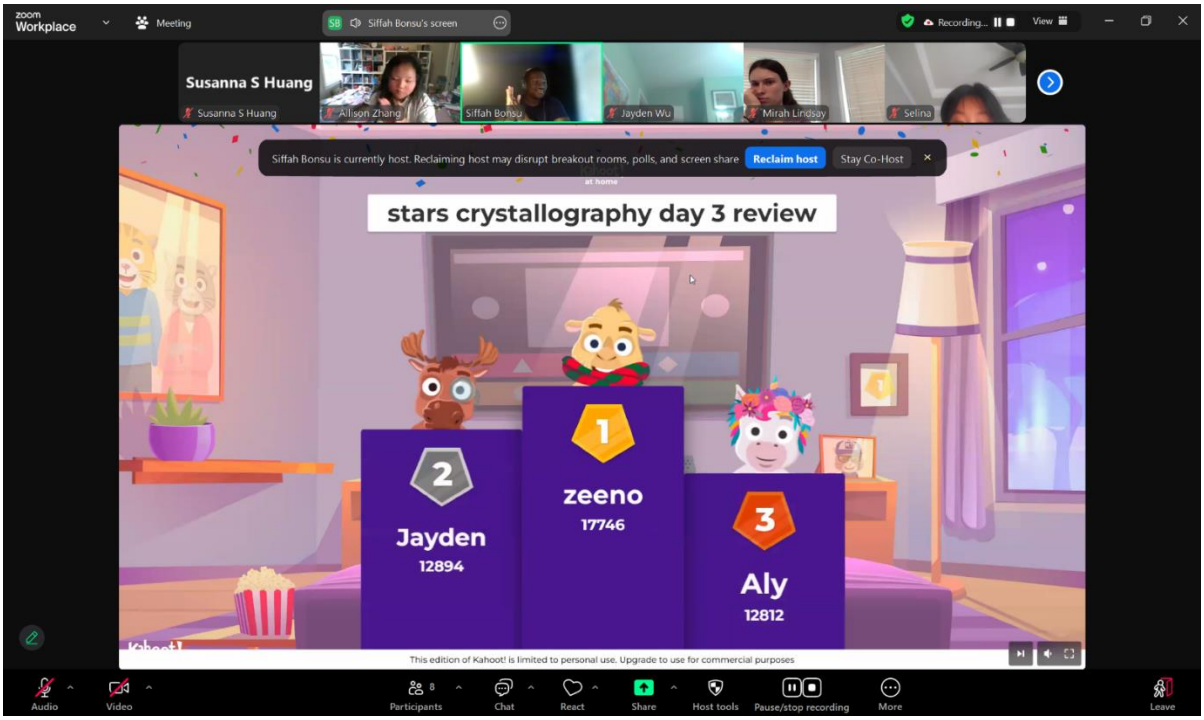
Selina showing 6-12th students how the highlighter ink in the crystal solution fluoresces under UV light in session three of day two.

DAY 3, July 3rd, 2024:

Mirah mixing a sugar solution as she lead the K-5th students through setting up their own solutions in session one of day three.



Addie leading the K-5th students through filling out their daily notebooks documenting their crystals in session two of day three.

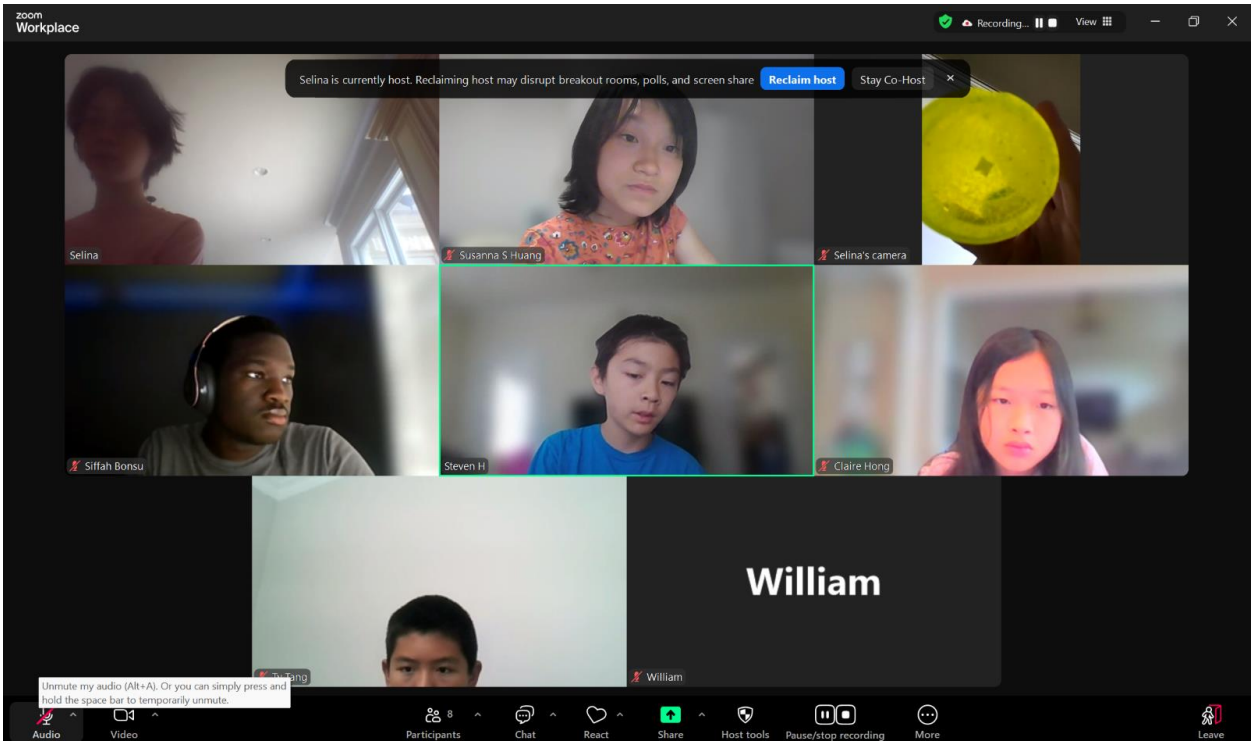


K-5th students participating in a Kahoot run by Siffah in the fourth session of the third day.

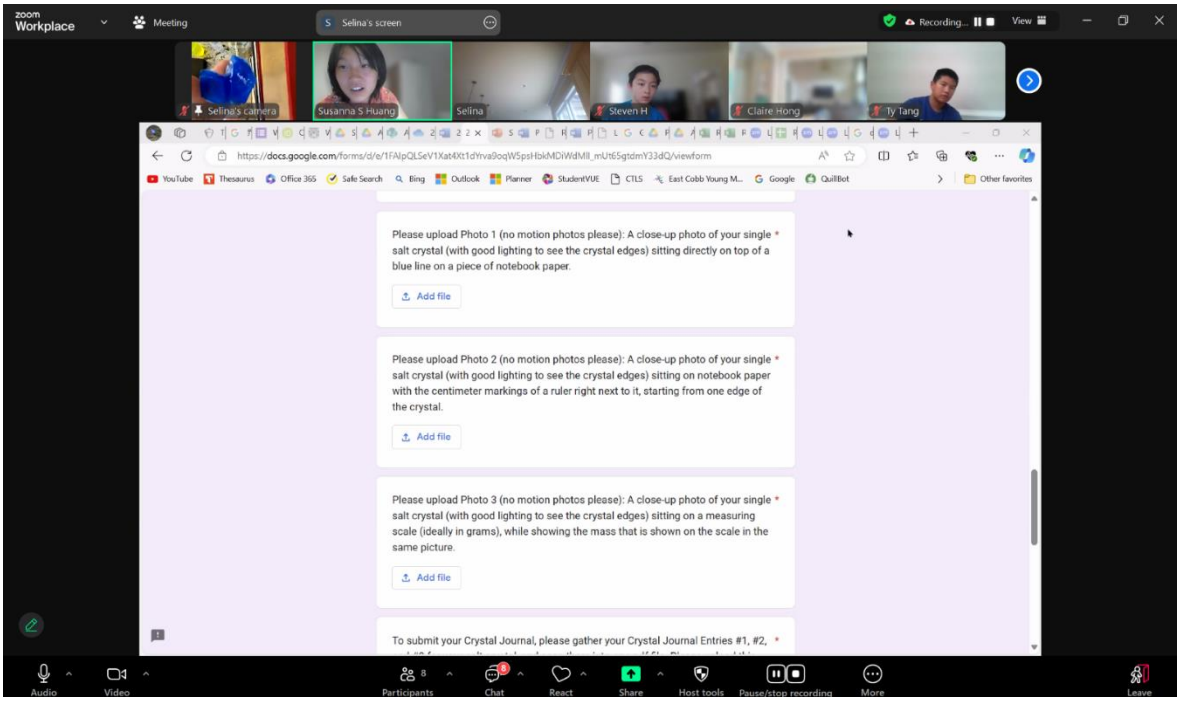
Siffah leading the K-5th students through a Kahoot in session four of day three.

Photo of volunteers from day three.

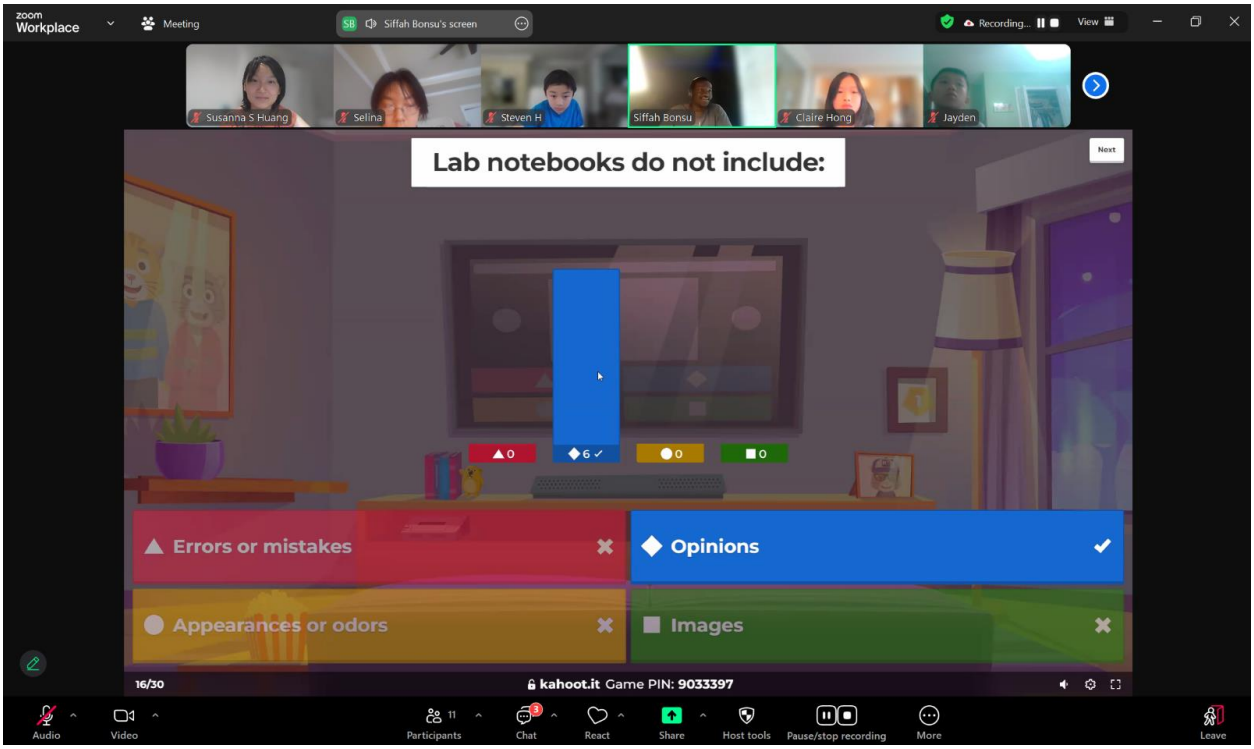
DAY 4, July 4th, 2024:



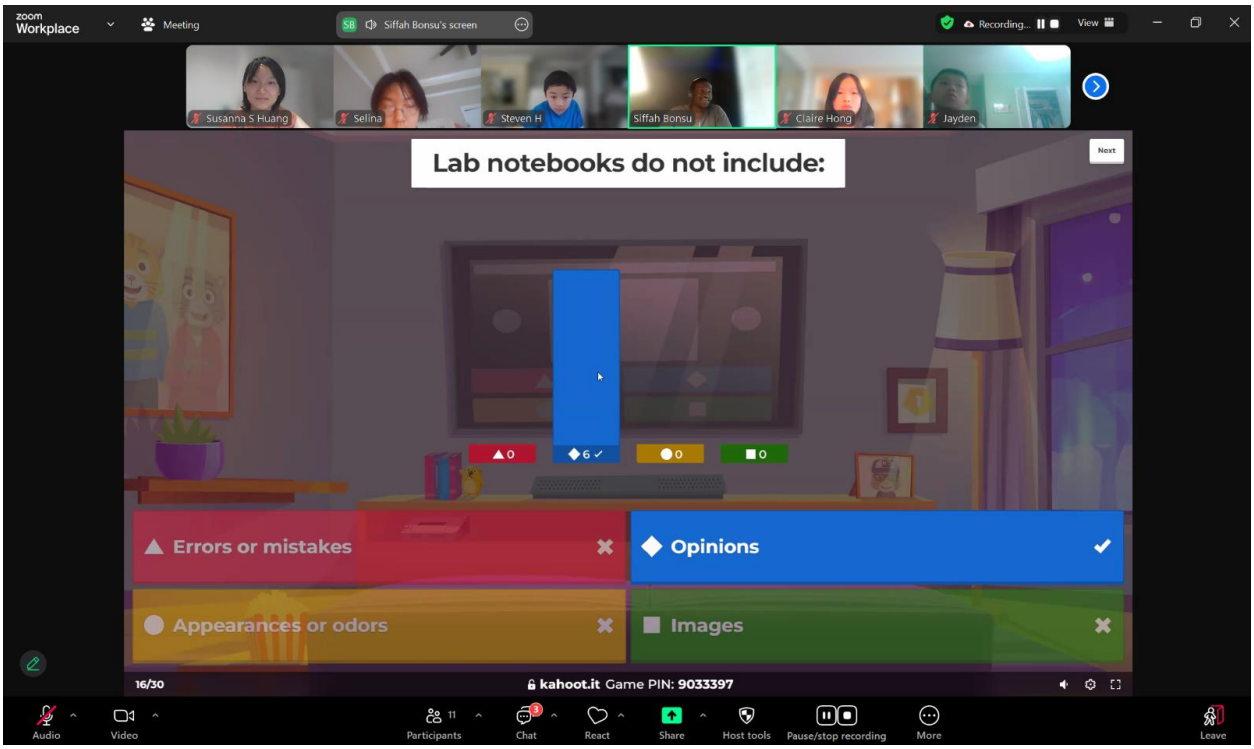
Selina talking to the 6-12th students about the salt crystals that they grew during the camp and how to submit them to the crystal growing competition in session two of day four.



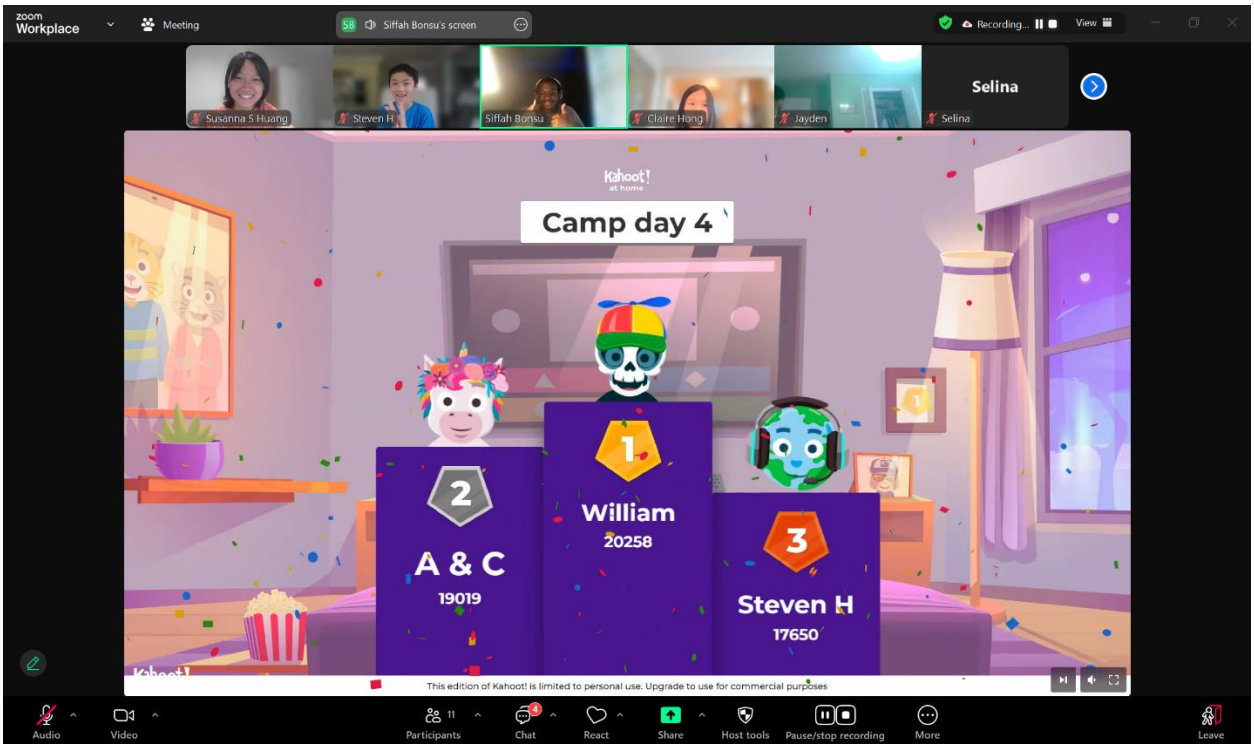
6-12th students filling out the crystal growing competition form in session two of day four.



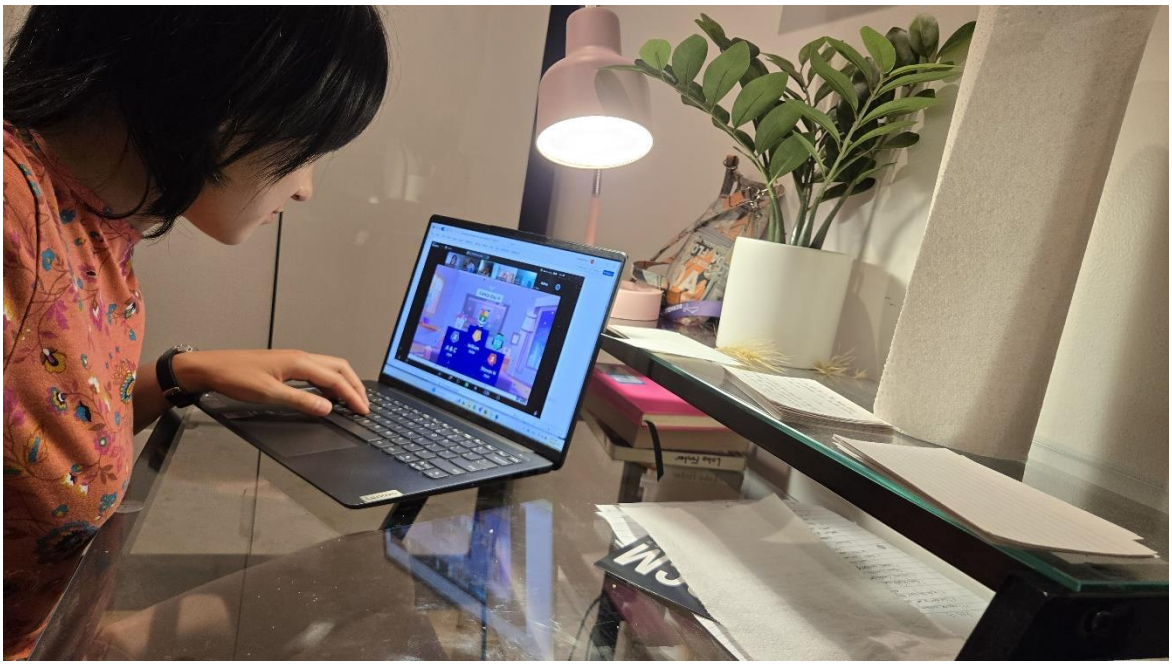
Addie teaching the notebook session and discussing the crystal growing competition on day four of the camp.



Students K-12th grade competed in a comprehensive mega Kahoot about everything they learned during the camp in session four of day four.



Students competed well in the mega Kahoot in session four of day four and had a great time.



Susanna watching the students participate in the mega Kahoot in the fourth session of the fourth day.

Mirah’s (right) and Caelyn’s (left) sugar crystals!

STARS nonprofit activities summary

- Competed in the US Crystal-Growing Competition (USCGC) annually [Fall 2019 – current]
    - 2019 USCGC – Susanna Huang won 2nd place in the clearest crystal category (Walton STARS branch; Acting president: Susanna Huang)
    - 2020 USCGC – Team members experimented with crystallizing glow-in-the-dark highlighter ink and quinine into crystals (Walton STARS branch; Acting president: Susanna Huang)
    - 2021 USCGC – Walton STARS branch (Acting president: Susanna Huang)
    - 2022 USCGC – Walton STARS branch (Acting president: Selina Huang)
    - 2023 USCGC – Walton STARS branch (Acting president: Selina Huang)
- Hosted and organized local crystal-growing competitions annually [Spr. 2021 – current]
    - 2021 Timber Ridge Crystal-Growing Competition
    - 2022 Cobb County Crystal-Growing Competition
    - 2023 Dodgen Crystal-Growing Competition
- Hosted and organized local crystal-growing summer camp [Sum. 2021 – current]
    - 2021 STARS Crystal-Growing Summer Camp
    - 2022 STARS Crystal-Growing Summer Camp
    - 2024 STARS Crystal-Growing Summer Camp
- Presented at Cobb County STEM teacher conference [Sum. 2021 – Sum. 2022]
    - 2021 STEMapalooza STEM teacher conference
    - 2022 STEMapalooza STEM teacher conference
- Presented at American Crystallographic Association annual conference [Sum. 2023 – current]
    - 2023 ACA conference (Baltimore, Maryland)
- Hosted and organized crystallography workshops [Spring 2024 – current]
    - 2024 Crystallography Lecture and Crystallization Workshop with Dr. Liu – STARS at GT branch (Acting president: Susanna Huang)
    - 2024 Crystallography Lecture with Dr. Max Bernbeck (Georgia Tech: La Pierre Group) and Crystallization Workshop with STARS at GT branch (Acting president: Susanna Huang)
    - 2024 STARS Crystallography Workshop at Walton HS