Supercomputing Challenge Annual Report
December 2021
Submitted by Paige Prescott, Executive Director

Overview

Supercomputing Challenge (SC) is in the midst of its 32nd year as a STEM education organization. Our mission is to provide a venue for budding scientists, researchers, and engineers to learn computational science skills (modeling or simulations, data collection, visualization, research, and algorithms) applicable to numerous STEM fields Aspects of this history are found on the website https://supercomputingchallenge.org/21-22/about.php

One of the incredible outcomes of this history is that our alumni are now in tech positions around the country and are wanting to give back and re-engage with something that meant so much to them when they were in school. Alumni have given workshops on Technical Writing, acted as mentors to student teams, provided workshops during the Kickoff as well as beenExpo Judges. We feel that this is an area to expand and may lead to some excellent resources in the future.

Recognition, Support & Outreach

We were recognized by AFRL in May 2021 for STEMys as the 2021 STEM non-profit of the year and had the pleasure to see one of our Expo winners from April 2021 as one of the recipients of a STEMy as well. On October 16th we participated in the Computer Science Alliance Fall Computer Science Education Summit where we had a table and made many great connections to teachers that have participated in the past or showed interest in getting started. We ran a workshop for educators, sharing our vision of problem-based learning, and had a long-time teacher sponsor, Alan Daugherty, help with the presentation. NM Tech Council annually has a fall Experience IT conference, this year November 4th. They gave SC staff free tickets as well as a table to promote SC. Some good connections were made at this event, including a contribution from Intel towards our scholarship fund.

Our funding continues to be primarily from our local community of STEM education funders. This is both an area of strength and a weakness. Our relationship with Los Alamos National Labs and Sandia National Labs continues to be strong. Many of their employees get involved in the Supercomputing Challenge as mentors and judges. We have received significant support from Triad/LANL through their Community Programs Office, including a grant to help us create a new digital badging initiative to incentivize our teams over the duration of their project rather than just a single recognition when they submit their project and present it at the annual Expo.

(More on the digital badging initiative later in this report.)

New Initiatives

Data Science Education

Supercomputing Challenge staff has identified Data Science as an area of expansion. There are many overlaps in terms of skills and communication of data that are important for our participating students. We started focusing on data science during our Summer Teacher Institute of 2020 through a partnership with UNM and NMEPSCoR to run a 3-day Data Carpentries summer workshop for 10 SC teachers. We then applied for a small grant from Intel of $2500 to develop a professional learning community (PLC) for our SC teachers to meet regularly and learn about data science together. We had 9 teachers from around the state meet monthly (via Zoom) to discuss data science and share resources including reviewing past projects that used data science skills and thinking about how best to develop these skills in our current student teams. This Data Science PLC proved to be a successful way of engaging with our teachers and through this pilot program, we learned that NM teachers are eager to learn more about Data Science education and how to bring these skills to their students through both SC projects as well as into their regular classes in science and computer science. We expanded on our initial success by applying for a larger grant from Sandia Labs in order to further develop Data Science education, an initiative we called "Building a Data Literate Community". We were funded for $20,000 (from the requested $25,000) to further develop our community of educators through our regular STI structure as well as through weekly data science clubs. We partnered with Computer Science Alliance to have a few of our teachers attend a 4-day summer professional development workshop to learn the Bootstrap Data Science curriculum and also used the participant list from that PD workshop to recruit more teachers. One of our regular SC teacher sponsors was very excited to learn the Bootstrap curriculum. She became our main facilitator for the 2021 STI as well as running the data science clubs for students. These clubs met weekly to go through the data science curriculum. This proved to be challenging to keep students and their teachers engaged during Fall 2021, much of which is due to the ongoing pandemic and the struggles that educators and students continue to have. We feel it was a successful project, but we have some areas to improve for a future iteration of this approach.

Digital Badging

Digital badging is relatively new in education and is based on how badges for skills in Scouts works. In the case of digital badging, there are digital mechanisms for creating and awarding badges for a variety of tasks, skills, and academic achievements that can then become part of a person's resume and digital portfolio. For the Supercomputing Challenge, we have noticed that over the past few years, many of our students are having more trouble successfully completing their SC projects than in prior years. We spent time interviewing teachers and students to find out some of the causes of this drop-off. Beyond the basic access to technology, the teachers had difficulty keeping students motivated and engaged with the year-long SC process. SC proposed to develop a digital badging system for students that successfully meet the

benchmarks
needed for completing their SC projects. We were invited to apply for a LANL Triad Cybergrant in October 2021 and decided it was time to invest in developing a pilot project for the digital badges. We received $20,802 to invest in this project. We hope that we will be able to show modest gains in getting student teams to complete their projects this Spring 2022. Currently, Creighton Eddington from REAP (Rural Education Advancement Program) and a longtime SC mentor, teacher, and volunteer, arecan the work to develop a prototype for the badge that can be piloted this Spring. Our vision is to have these badges be part of Canvas, a learning management system, that could also be a mechanism of communication and tracking of the progress of our teams and their projects.

Datacasting Action Research Project

We have partnered with Claro Consulting to participate in an initiative funded by NMPED to determine whether datacasting using existing TV broadcast signals is a mechanism for connectivity of NM families that don't currently have access to the internet at home. SC's role is to help student teams and their teachers to set up the datacasting devices (Raspberry Pis) and to help them turn their action research projects into viable SC projects as well. We plan to have a special award for these teams.

Academic Year 2021-22 Summary- the start of our Academic Marathon

As always, we began our SC year in August by reaching out to teachers and former students. We open registration in September and then launch the SC year with our Kickoff. We made some adjustments to our typical dates but overall have kept the SC year to be similar.

Kickoff 2021 was held on October 9th. We did it virtually on Hopin for the 2nd time. We had about 70 students and teachers participate with 21 presenters & workshop helpers and an additional 10 participants from different roles such as the welcome message or just curious to learn more about SC. This year we felt we had more trouble getting student teams & teachers to commit to our Kickoff event. In the past we have done this in-person on the NM Tech campus. While we recognize that it costs significantly more for an in-person event ($35,000 vs. $3000) we feel that there is an intrinsic value for having students interact with our volunteers in person rather than virtually. Below is our schedule for the day. We had six alumni join us for the day and were part of delivering a strong message about how important SC was to their development, work in college, and their careers now. Link to more info on the event.

Kickoff 2021 Schedule

Time	Track A	Track B	Track C	Track D	Track E	Where
8:45-9:00	**Networking/music**					Hopin Stage/Hopin Networking
9-9:30	**Welcome & Keynotes** **Overview -** Paige Prescott **and** David Kratzer **LANL welcomes you! John Sarrao** **Challenge Board President - Matthew Curry** **Burning Hot Wildfires -** Stephen Guerin **Importance of Mentors for Your Success - Joan and Daniel Appel**					Hopin Stage
9:30-11:30	Intro to StarLogo Nova	Introduction to NetLogo	Wildfire Simulations with NetLogo	Introduction to Python	Data Visualization with Python	Hopin Session
11:30-12:00	Developing a strong project (rubric overview, resources like past reports, potential topics) Go over Team Project Development (aka Virtual Meet the Scientist)					Hopin Session
12:00-12:30	**Lunch & Networking** Meet tech professionals, university faculty & students, Challenge alum, fellow students and other cool people during lunch. Go to our Expo and tour some NM colleges and meet our main sponsors.					Hopin Networking, Expo & lunch on your own
12:30-1:30	**Broaden Knowledge -** variety of sessions to inspire your projects and computer science skills					Hopin Sessions
1:30-1:45	Quick break & Networking					Hopin networking
1:45-2:45	**Broaden Knowledge -** Sessions repeat from the previous set; choose a different topic.					Hopin Session
2:45-3:00	Closing event with random drawing for awesome prize$. Must be present to win!					Hopin Stage

We have modified some of our deadlines to be more aligned with the reality of our students. We extended the due date of the proposal to be later in the cycle and to come after they meet with a scientist/mentor. Meet the Scientist was typically part of the in-person Kickoff where teams would get feedback on their proposals. However, we found that these early proposals often changed dramatically by the end of the semester and that getting feedback so early was not helpful. We changed the structure of the Meet the Scientist (MTS) event and were able to make it more worthwhile for the teams. MTS was done virtually and prior to their assigned time, we had teams fill out a form that captured some important information that, with the help of the MTS volunteer, could be crafted into a meaningful project proposal. We were overall pleased with the outcome of these changes and will likely keep a similar structure in the future.

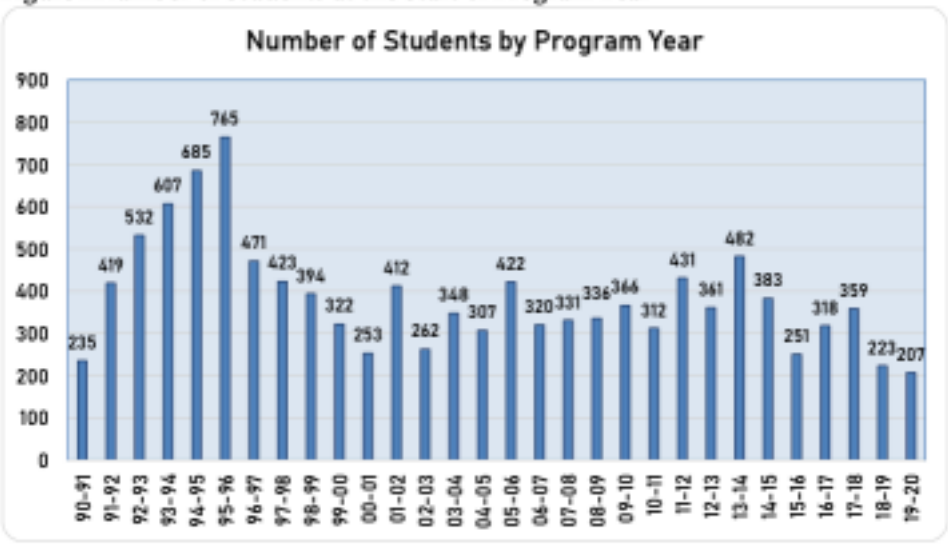
We updated our rubric to emphasize the computer code used in the projects. This new rubric will be used for Expo 2022.

Teachers that participated in STI 2021 were eligible for a $250 stipend if they also had at least one team registered by December 1st. In the past, we have typically paid teachers for their participation at the end of STI. This is the first time we have linked their stipend to also having teams registered. We feel this is an appropriate change and will likely continue this going forward.

2021-22 data

We currently have 161 students registered from 31 schools including one girls' school in Palestine. * This is showing a slight downward trend in participation over the years. In Figure 1, a screenshot from our program evaluation document, you can see that there have been fluctuations in participation but seems to hold steady in working with over 250 students per year. Some of the decreases in participation can be explained by the impact of the pandemic on our education system. Teachers reported having difficulty connecting with students, especially when the class was virtual. In general, there is a decline statewide in participation in out-of-school commitments like clubs or SC. Teachers are also feeling overwhelmed by the shifting sands of their educational duties and it has been harder to get teachers to commit as well.

Figure 1 Number of Students at the Start of Program Year



*This connection has been made through a new organization in Albuquerque, Justice Code, that meets on Saturdays and has a very interesting network of students that are engaged in SC projects.

Scholarships

Spring 2021 we awarded all 4 applicants scholarships to help launch their STEM studies in college. A total of $7800 was given out, $4800 of which were from the institutes of higher education where they are currently attending and $3000 from funds we raised to directly support them. These funds are usually paid directly to the college or university they are attending. This year we are anticipating more applicants and are actively trying to raise funds to make sure we are able to support these students in need. Our annual goal is to raise $8,000 per year which is in addition to the scholarships that come from our NM institutions. AFRL, Van Dyke Software, Descartes Labs, HPE, and Big Byte have contributed in the past and we hope to keep their support as well as grow this base of contributing companies. We find that the scholarship opportunities are something that motivates seniors to stay in SC and complete their projects.

Budget

In 2020, SC had an annual operating budget of $171,663 with an additional $242,457 in the bank. As of 12/02/2021, our current balance is $157, 381, the majority of which is considered restricted to categories identified in the grants or contracts with an additional $7807 in our Nusenda account that mainly accounts for unrestricted funds. Our budget for this year was also expected to be $171,000.

Revenue for 2021 includes:

$20,000, Sandia Labs grant, Building a Data Literate Community
$20,802, LANL Triad Cybergrant for Digital Badges
$15,000, NM Consortium, program support
$38,000 Datacasting Project with Claro Consulting
AFRL & Intel for Scholarships
Benevity & Amazon Smiles as well as team registration fees bring in some additional funds of about $3000
Contributions from local businesses and individuals help to fund specific awards that are given out during the Expo Ceremony.

Major expenditures continue to be for contract labor (staff and Executive Director are included in this category). This accounts for over 80% of our budget at $134,000. Other expenses are from the annual Expo Ceremony, which in 2021 cost about $10000 in awards and prizes, not including the scholarships that were previously mentioned. Insurance, online tools like Zoom, and annual accountant fees for IRS reporting add up to about $10000. Stipends paid to special presenters and teachers for participating in specific events is approximately $15000. The New Mexico Consortium oversees our accounts and for the past 2 years has helped SC set up systems for paying stipends and invoices. This service is very valuable and will help position SC for larger grants in the future that have more regular reporting. NM Consortium does not charge SC for this work.

As in prior years, stable funding is a dire need for our non-profit. The revenue we have been able to raise is mainly through grants that support specific initiatives rather than general program support and cover the operational expenses of running our organization. If we are to go back to in-person events, the costs will increase significantly. In the past, the Kickoff has cost about $40,000 and the Expo about $50,000. If SC is to restart these in-person events, the funding needs will increase considerably.

Summary and next steps

Overall, the Supercomputing Challenge continues to play an important part in our STEM education community and we value everyone that participates, volunteers, and contributes to making our organization a success.

In the near term, managing the communication tools will be important. SC has begun using bulk texting to communicate with students and teachers and continues with weekly messages via Mailchimp. Increasingly, we are finding that SC emails to students are blocked by school districts. The website needs to be updated with more user-friendly tools for registering teams and submitting documentation that can be accessed by multiple people including the team members, the teacher sponsor, mentors, and the SC staff. Investing in Canvas to manage these processes might help solve this ongoing issue. The staff has just transitioned to using a new email system which has caused a few hiccups in terms of being able to receive emails to our main source of receiving emails from our community (consult@supercomputingchallenge.org)

There will be a significant transition as a new Executive Director is selected. Following up on the requirements of each of the grants and MOUs as well as expanding partnerships with other organizations will be needed in addition to maintaining the flow of the SC academic year. No doubt the seasoned staff will be able to help navigate this effectively. They care deeply about SC and make sure that the teams and teachers are supported and that volunteers are recruited to help at the necessary times.

A personal note from Paige:

It has been a pleasure and an honor to be the Executive Director of Supercomputing Challenge for the past two years. I look forward to seeing the Supercomputing Challenge thrive in the coming years.

Sincerely,

Paige Prescott