

**NASA Advisory Council
Science, Technology, Engineering, and Mathematics (STEM)
Engagement Committee**

NOTES

February 17, 2022

STEM Engagement Committee Members

Present: Dan Dumbacher (Committee Chair), Jamarius Reid (President, Student Government Association), Norman Fortenberry (Executive Director), Ray Mellado (Founder & Chairman), Tara Strang, Kristen De Vivo (Executive Director), Darryl Williams (Senior Vice President of Science and Education)

Others Present: Kris Brown, Mike Kincaid, Lisa Stewart, Bev Girten (Executive Secretary), Eleasah Banks, Kelly Calagna, Anne Marie Demme, Ashley Bishop, Rick Gilmore

Opening Comments

Mike Kincaid welcomed everyone and noted the virtual meeting is public. Dan Dumbacher provided introductory comments. The committee members introduced themselves and Jamarius Reid was recognized as the first student representative through a competitive selection process. Mr. Kincaid provided an overview of the agenda.

Dr. Beverly Girten, Committee Executive Secretary, welcomed everyone and noted the meeting is a virtual meeting via Webex and is taking place in accordance with the Federal Advisory Committee ACT (FACA). Dr. Girten also requested for everyone to keep mic muted when not speaking and noted that the meeting is being recorded.

Landscape

Mike Kincaid gave an overview of NASA's Office of STEM Engagement's vision, mission statement and strategic goals. Mr. Kincaid explained that NASA is in the center of the STEM ecosystem and noted the alignment between the OSTEM and OSTP/OMB Priorities. He also reminded the committee that events across the agency continuously drive the landscape we work in. Mr. Kincaid mentioned that during her first National Space Council Meeting, Madame Vice President requested the prioritization of using space to engage students in STEM.

Overview of STEM Engagement

Kris Brown described NASA's STEM engagement efforts as a continuum of learning opportunities and products for students to first attract them into STEM and then support them as they participate in the STEM pipeline. Attracting students into STEM is being achieved by

employing evidence-based opportunities and ensuring accessibility of all efforts. Ms. Brown detailed the three primary areas of focus for K-12 efforts; broadening student participation, continue building productive strategic partnerships and networks, and expanding NASA's contributions in engaging K-12 students.

Mike Kincaid emphasized the importance of reaching students through teachers. NASA effectively supports the educational community by providing standard aligned lessons, guided educational activities, the NASA Express newsletter, and professional development opportunities. He introduced NASA CONNECTS, a program pilot targeted for Spring 2022 where educators can communicate with other educators, ask questions, collaborate, and share best practices. Students can engage directly with NASA through challenges and experiences offered on nasa.stem.gov such as the Artemis Student Challenges. The Artemis Student Challenges group together opportunities for students that contribute to the Artemis missions. NASA's Internship program is well received, accepting 27,000 applicants during the Summer of 2021.

Mr. Kincaid shared program updates for Space Grant, EPSCoR, MUREP, and NextGen STEM. Mr. Kincaid included that within our MUREP program, OCEAN was developed with a focus to open opportunities for MSI's to participate in NASA's market. NextGen STEM, the program focused on k-12 efforts has undergone significant growth. Within NextGen STEM, there is TEAM II, lead by Dr. Bev Girten, gives out about 3 awards per year totaling \$1,000,000 over a three year span. Many of the opportunities are funded by mission directorate contributions. It was reported that almost 30% went to minority students and 41% went to women. The NASA OSTEM 2021 Highlights report will be distributed before the full NAC meeting at the end of the month and contains a snapshot of successes from the past year. Public engagement has seen steady growth and the time spent on the nasa.stem.gov is up 17% between FY20 and FY21.

NAC Topics Review

Dan Dumbacher presented a review of the previous NAC meeting in October 2020. Mr. Dumbacher highlighted the concern for what kind of equity issues that could stem from COVID. He congratulated NASA STEM for the quick response in getting NASA STEM at home materials available to the public addressing some of the challenges during early stages of the pandemic. Mr. Dumbacher also commended NASA's strategic goals. While the alignment with the NASA mission is clear, he suggested the prioritization of opportunities for minorities and underserved communities. OSTEM has built a great positive partnership with the National Science Foundation with the INCLUDES program and are open to other potential partnerships within the MUREP program. It was noted that there may be an opportunity for NASA to play a convening role in reinventing the education ecosystem. Discussion centered on the potential ability to leverage partnerships and capabilities of both NASA and the National Science Foundation to influence learning in the virtual environment.

Mr. Dumbacher reported a set of findings from the previous NAC Meeting. Mr. Dumbacher then reported the recommendations that was taken to the NAC that required attention and

noted that all of the recommendations were passed along to the NASA advisory council and well received.

Mr. Mellado inquired if NASA can share slides and data with other agencies in the federal government. Mr. Kincaid responded that yes, it can be shared and encouraged Mr. Mellado to do so, stating that; the more we can connect, the more the federal government is as well as our students.

Kristin De Vivo asked Mr. Dumbacher to elaborate on the thought behind reinvention of the ecosystem concept present in his slides. Mr. Dumbacher responded stating they did not get into the details, methodologies, or solutions, just identified the need and will look to address the thought further in future meetings. Mr. Kincaid added that since it's been 18 months since the last meeting we wanted to share the goals and where we were previously. He stated for new attendees that an added benefit of reviewing past findings and recommendations is that it illustrates an example of what the group will have a new version of by the end of the meeting.

Dr. Girtten reminded the committee what was presented was in an informal abbreviated way to the full NAC and never went forward officially, they weren't put on the appropriate forms, so the council did not consider them. They are aware of them, but no formal action has been taken yet. If you want action then we will need to add them into the new recommendations and findings we develop today. Mr. Kincaid reiterated the 3 priorities of STEM, Broadening Participation, K-12 Efforts, and Partnerships.

Broadening Student Participation

Mike Kincaid reaffirmed the importance of and commitment to DEIA to NASA. Mr. Kincaid reviewed the purpose and overarching goals of this NASA Stem focus area. A team was developed to create a broadening student participation plan whose objectives will track the effects on our programs' evaluation and approach. Mr. Kincaid explain the importance of reviewing past action, evaluating all efforts, not just MUREP and considering how to leverage partnerships. Mr. Kincaid reviewed MUREP's vision and it's 4 pillars of investment and engagement. Mr. Kincaid then notes the executive orders that serve as a foundation for what NASA does. Mr. Kincaid rhetorically inquired how to make a difference in engagement needed to aid each level of awareness, degree commitment, degree persistence, and degree attainment.

Mr. Kincaid shared data from the NASA Internship team breaking down the percentages of ethnic, racial, and gendered groups in the FY20 and FY21 intern groups. In reviewing the FY21 interns that were managed by the Office of STEM Engagement, the data is more diverse than what you'd find in our nation's representative breakdown of diversity in STEM degrees. The applicant pool has changed drastically between FY20 and FY21 with almost 12,000 more students applying (a 73% increase). In terms of underserved populations, we determine at

whether they are applying, if they are being selected, and how they perform in those roles.

There was a discussion explaining the percentages and the way the data was presented. Mr. Dumbacher asked if the overall number of applications went up and the number of applicants is higher than the percent increase for those who were selected, what does Mr. Kincaid think the driver is. Mr. Kincaid responded by stating that we have to look at if the overall number, 73%, the numbers of the applicants went significantly up. So if the whole group grew by 14%, compared to this number, the only group that did not increase was the non-minority white students. Norman Fortenberry suggested having the chart show the percentage of the total pool instead of the percentage of the increase. Mr. Kincaid agreed that would be useful and then referenced the slide with the pie chart. For comparative purposes, Mr. Fortenberry stated he would like to see the same data for applicants selected (the current chart is applicants as a whole).

Darryl Williams asked when looking at the applicant pool, the stratification in terms of who are applying, and if there is data on awareness mechanisms. In other words, how are students finding out and learning about this and what are the strategies that different places use to make students aware of how these opportunities exist. Mr. Kincaid agreed that it would be helpful to know how this, he is unaware of whether the intern team currently tracks that data point. Kristin De Vivo agreed in the benefit of tracking that metric to figure out how to influence DEI across opportunities based on how students are hearing about them.

Jamarius Reid stated when looking at the data what stands out is the difference in the Asian group and white group. The white student group has maintained, and the Asian student group has increased. But he was curious to know how that is reflected in the other minority groups. Mr. Kincaid pointed out that Black and Hispanic groups have also significantly increased explaining the slide data. Mr. Reid explained what PAXC is and its contribution to creating a community for interns at NASA. Mr. Kincaid adds that you're more likely to stay at a job where there are more people that are like you, groups like PAXC provided this connection agency wide for students to relate to other people in a similar situation.

Mr. Dumbacher asked to discuss inequalities in the selection process and if there had been progress. He observed there was an increase of 99% in American Indian or Alaskan Native students applying then to only 11% increase in being selected. Mr. Kincaid responded clarifying how those percentages actually compare, as it is not exactly 99% to 11% but rather, 99% to 73% for applications and then went up in selection by 14%, so 14% should be compared to the 11%.

Mr. Kincaid agreed on the importance of discussing inequities and potential biases. He explained how mentors select their interns and that there is always room for improvement. Kris Brown commented on bigger picture of the internship program and looking ahead. This team is comprised of leaders within OSTEM's internships programs with respect to practices and approaches. One focus is the DEI piece and allowing them training opportunities, community, and other opportunities. Another element is training awareness for the mentor community

who are working with these students. Also, awareness around their selection processes and how they look at their applicants and what they're looking for. This has been powerful for the community at large. The community is also working on best practices for intake process including selection processes. NASA has an internships outcome study that has been looking at value proposition for interns in terms of what they've taken away.

Mr. Dumbacher commented the importance of being very intentional in the selection process. Mr. Kincaid agreed. Mr. Fortenberry broke down the data from 2020-2021 to clarify the numbers for the group one last time. Ms. De Vivo advised that a factor analysis could be applied to see what factors are driving the selection process. Ms. Brown shared that NASA has used Space Grant who sponsors interns through funding, but in addition to that, has been working with advocacy groups and associations that are devoted to these constituency groups. She commented that it would be interesting to see if OSTEM could do some qualitative analysis and have the committee weigh in on whether there are other vehicles or avenues that should be used.

K-12 Efforts

Kris Brown shared the critical need for investments in K-12 and notes that all prior dialogue regarding broadening student participation applies to this audience. It is important to consider how to attract, engage, and support students involved in stem and what incremental learning activities can be provided to support students. Ms. Brown discussed the drivers to design a K-12 foundation and the K-12 framework. NASA continues to develop unique learning opportunities to attract students formally and informally such as the pilot NASA CONNECTS which allows NASA to build relationships with teachers. OSTEM is focused on outcomes and the ability to measure progress and then take that evidence to impact future programs and opportunities. One of the building blocks is partnerships and the systematic approach to build them within networks of the larger STEM ecosystems.

Mr. Dumbacher opened the floor to questions or comments. Mr. Reid mentioned that there was nothing stated about innovation. He asked if OSTEM can create an opportunity to explore this generations' values and that it might be beneficial. Mr. Fortenberry shared there might be an opportunity for analysis from a social scientist point of view and the research that is available. Kris advised that the educational tools and platforms have done work in this area by taking on personas to see how they would navigate the space that is out there. Mr. Williams mentioned that there might be an opportunity to do more work with the National Science Foundation as they have a lot of rich evidence-based data on the communities of practice. Mr. Dumbacher ask if Ms. Brown had communicated with the National Science Teachers Association to which she confirmed that OSTEM has a relationship with them and that is a great avenue to pursue. Ms. Brown also informed the group that OSTEM has a recent hire coming in from NSF who is bringing thoughts on how to engage with K-12 formal education which will help position us to work with NSF and their studies.

Ms. De Vivo provided praise for the work going into this effort. She mentioned that it looks like the team is looking at the missions for the end goals of the learning. If so, that does not necessarily align with the goal of setting students up to be a part of this diverse workforce. If we were to look at an opportunity to broaden the approach to think about the overall development for students in STEM tracks. Ms. Brown explained that NextGenSTEM has gone through the methodical analysis that is outcome driven and the learning opportunities that are available. K-12 studies are looking at how we shift the work that we have done. The profile of the work completed has shifted within the last couple of years based on that evidence.

Partnerships

Mr. Kincaid shared OSTEM's current partnerships and goals to expand reach with LEGO and STEM NEXT among other partners. He highlighted notable accomplishments in FY2021 including 12 new agreements, 17 informal agreements, and 94 different organizations OSTEM has worked with between April 2020 and May 2021. The Artemis Summit Meeting is an example of how OSTEM engages partners to realize high priority agency goals and messaging. These kinds of events garner high visibility and support.

Measuring Success

Tara Strang, NASA OSTEM's assistant program manager of the performance assessment and evaluation team, shared an overview of the strategic performance framework and explained how the strategy is built. The team uses a strategy performance framework to identify a performance assessment and then evaluates and addresses their identified learning agenda. The goal of the learning agency development and implementation is to generate and refine a process to look systematically across performance and evaluation activities, identifying gaps in knowledge and establishing a research agenda that generates knowledge to fill these gaps. Ms. Strang then provided a high level overview of the contributions to NASA's missions and work from FY19-21 that was done in support of the questions, to what extent OSTEM's investments contribute to NASA's missions and work, how OSTEM's investments broadened participation of historically underrepresented and underserved groups in the STEM fields in NASA STEM engagement activities, to what extent enhancements to OSTEM performance assessment and evaluation have been implemented, and what the effective strategies are that best support and measure OSTEM investments' abilities to spark K-12 student's STEM interests. The new OSTEM Gateway will be used to help track student's engagement over a longer period.

Mr. Fortenberry asked, given the target audience K-12, how is anonymity respected? Ms. Strang shared that Gateway only registers students who are 16 and older. Mr. Kincaid then shared that the back end of Gateway is Salesforce, which is a tool that pulls the information together. He noted that it will still be difficult to help pull data from classrooms and ages

younger than 16.

Ms. De Vivo commented there will still be trouble tracking based on terms of use and asked if there will be a chance to see the logic model for K-12. Ms. Strang advised that it was created as a part of this assessment and will follow up with those results. Mr. Dumbacher asked if there were key metrics that are being tracked. Ms. Strang responded that there are different metrics supporting each learning question. The research and development products created with student support, paper publications and presentations also offer a long-term metric of increasing diversity. Ms. Strang noted the program tracks diversity on a yearly basis.

Mr. Dumbacher asked how open they are open to sharing this information with the larger community to help facilitate what metrics are being used. Ms. Strang responded that there is an interagency working group to verify transparency and accountability and her team lead Rick Gilmore will be attending the upcoming roundtable focusing on this. Mr. Kincaid shared that there is an interagency group under OSTP that OSTEM contributes to. Mr. Kincaid advised that we are more than open to dive deeper into this in a future meeting with this as a focus.

Ms. De Vivo asked what Ms. Strang was referring to when mentioning that the outcome measure for K-12 is engagement. Ms. Strang responded that they look at the number of applicants and participants. Ms. De Vivo then asked if there is a teacher certification path, incentivizing to participate through a special training opportunity that way you can see how many teachers you certify each year. Mr. Kincaid shared that approximately 5 years ago there was a badging process for teachers who had done work with OSTEM, but he was not sure of the status. Ms. De Vivo encouraged certification over an itemized badging process. Mr. Kincaid agreed and as OSTEM explores what NASA CONNECTS contributes, what might the option for continuing education for teachers look like. Ms. De Vivo noted that the mediator between our resources and students is the teacher. Teachers are not prepared at this time, so whatever OSTEM could do to professionalize teaching to support this initiative will then prepare the students. Mr. Kincaid advised that OSTEM follow up with Ms. De Vivo individually to spend some time discussing this certification option.

Mr. Williams comments on the need to look at the continuum of formal and informal education. He asked; looking at equity and inclusion, a lot of students we are trying to reach are engaging in out of school activities so how do we prepare these informal educators?

Finding & Recommendations

Dr. Girtten reminds the committee of the changes since the last meeting. Findings are points that to take forward to the full NAC that don't have to have a response or action from the administrator. A recommendation goes forward and a response or action is required from the

administrator. There is a one tier system so everything from a committee will go forward to the full NAC and then the full NAC will decide what goes forward to the administrator. All recommendations should be a high level item that would warrant a response from the administrator.

Findings

The committee finds that there continues to be evidence that progress is being made honing in on the strategic goals and vision for OSTEM. What was presented was very succinct. There is intentionality around identifying and making resources available for educators. Regarding internships data, there was a deep discussion on the marked progress in reaching a more diverse pool of students but there are still questions about what it is that is being effective. The committee looks forward to having a future discussion regarding the infrastructure for recruiting for internships, including service member and veterans. The progress in building partnerships has been significant. The committee recognizes the efforts in evaluations work. A thoughtful design and approach were taken. There is an opportunity to still learn about the metrics and outcomes used to measure performance, which is a potential focus topic for a future meeting. Interested in the aspect of being able to use Gateway to track the long term involvement of participants in OSTEM activities.

Recommendations

The committee recommends to keep up with the emphasis on the strategic plan, integrating and using this across NASA's mission directorates. Administrator and the mission directorates, along with the Office of Procurement, should ensure that there are higher goals to build research capabilities at Minority Serving Institutions (MSIs). NASA should support and create infrastructure to sustain MSIs, to enable them to be competitive and be successful in contributing to NASA work. This helps build a strong K-12 pipeline of interest and engagement. NASA, other FC-STEM agencies, and other current and potential partners should collaborate to support the STEM education community in addressing the disruption of schools and other identified challenges resulting from the ongoing pandemic. NASA alone cannot solve this.