



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

**December 4, 2018, 12:30 pm – 5:00 pm ET
NASA Headquarters, Room 4U25 and Webex**

STEM Task Force Council Members

Present: Cristin Dorgelo (virtual), Daniel Dumbacher, Norman Fortenberry, Michael Lach, Ray Mellado, Carl Person, Darryl Williams, and Aimee Kennedy, Chair

Others Present:

Beverly Girten (Executive Secretary), Michael Kincaid, Kris Brown, NASA HQ Office of STEM Engagement
Sandra May, Marshall Space Flight Center, Rick Gilmore (virtual), Glenn Research Center

Opening Comments and Administrator's Comments

Dr. Beverly Girten, Committee Executive Secretary welcomed everyone and noted the meeting is taking place in accordance with the Federal Advisory Committee Act (FACA). Mr. Mike Kincaid, Associate Administrator for STEM Engagement, introduced NASA Administrator Jim Bridenstine to the Committee, noting the Administrator's passion for STEM. Each Committee member then gave a brief introduction to the Administrator.

The Administrator began his comments by noting that NASA is becoming more involved in every part of society. He acknowledged the STEM Committee becoming part of the NASA Advisory Council as a great milestone. Mr. Bridenstine identified NASA's important role of inspiring the next generation and having it be recognized by the whole of government. Dr. Aimee Kennedy asked the Administrator to comment on the role of diversity and inclusion in the Federal STEM Education Five Year Strategic Plan and how it aligns with NASA's broader efforts. Mr. Bridenstine replied that NASA has been making improvements in that area but that broader representation of the American public does not happen overnight. Skills needed at NASA are specialized and not easily developed. The Federal government will need to develop a process and have multiple five year strategic plans so that in twenty years, today's seven year old will be inspired. For the Federal government to have broad representation in science and engineering, agencies across the Federal government have to reach into the underrepresented and underserved communities to take the best of what America has to offer. Dr. Kennedy asked the Administrator about how the STEM Engagement Committee can be of help and what he would like to see come out of the Committee. Mr. Bridenstine responded that NASA is unique and unlike any other agency. He commented that the Hill does not want any duplication of efforts. What NASA needs is to demonstrate that NASA is unique and exceptional, not duplicative. The Administrator then shared his personal moment of becoming inspired after participating in a wind tunnel in summer camp after fifth grade. The Committee can help this Agency head in direction that is not duplicative but unique and exceptional.

NASA is the only agency that can capture the imagination of a young person. The Administrator asked the Committee to think about each of the unique activities that NASA is doing and think about how to maximize them. Mr. Bridenstine noted that in order for the United States to stay ahead in technology, we have to be constantly vigilant in educating our next generation. Mr. Bridenstine stated what makes NASA unique is the ability to inspire. To get to the Moon, someone was inspired along the way. Landing on the Moon was a demonstration of our economic and technological prowess. When we landed on Mars last week, 270 newspaper covers worldwide had the story and that doesn't cover online impressions. We need to make sure kids are in the room when these important landings happen. Mr. Bridenstine told the committee he wants their help to think about what makes NASA unique and special.

Opening Remarks by Chair

Dr. Kennedy welcomed and thanked everyone for being present. She is inspired with the opportunity the Committee has before them. She stated we are at the ground floor of a new vision for STEM education and that being an official committee gives them more authority than they had before. The Agency is doing amazing work and the Committee has to think about how we can inspire the next generation of engineers and scientists.

Federal CoSTEM 5 Year Strategic Plan

Mr. Kincaid noted that the new Federal STEM Education Five Year Strategic Plan, released this week, is moving us in the direction of how we can better evaluate the work that we do. The plan connects agencies and serves as a marker for how states and local communities can improve STEM engagement. Dr. Kennedy noted the plan speaks to a broad audience and calls for quality education for all. The plan includes pre-K to twelfth grade and beyond. Dr. Kennedy acknowledged the concept of transdisciplinary learning, how content areas work together. Dr. Kennedy provided support for the plan matrix which lays out ownership for each of the agencies that are taking part in the plan. Mr. Ray Mellado commented the Committee as a group will monitor its implementation and progress. Mr. Kincaid noted that each agency was asked to identify from the nine objectives in the CoSTEM plan which they could support within the current budget structure. NASA picked three objectives to support: Foster STEM ecosystems that unite communities; Increase work-based learning and training through educator-employer partnerships; and Encourage transdisciplinary learning. Mr. Kincaid noted these objectives already align with Space Grant and EPSCoR activities. Mr. Kincaid stated the importance of evaluating education activities along the way, just as Mars missions are evaluated along the way. There is a significant amount of work to do to implement the strategic plan. Dr. Norman Fortenberry commented that STEM cannot exist on its own. Ethics, humanities and the arts cannot be ignored. CoSTEM will have one implementation plan for all agencies. NASA will look at how the agency fits within the implementation plan rather than have a separate implementation plan.

Office of STEM Engagement (OSTEM) Updates

Mr. Kincaid gave a broad overview of the work being done by Office of STEM Engagement (OSTEM). He stated OSTEM looks at the work of the Mission Directorates to leverage NASA's six themes. He noted that while the OSTEM beneficiaries are students, educators and institutions are critical components to enable and make a difference for students. The new Federal strategic plan for STEM education is helping NASA have conversations with partner agencies on how we can work together and learn from each other.

Super Search Engine

Sandra May, Senior Education Editor, noted her team was charged with making the NASA STEM Engagement web portal easier for students to find opportunities. Ms. May stated several modern web sites were evaluated for functionality and ease of use. She shared a comparison of OSTEM's existing web page to a design concept page. The search capability on the design concept includes a search widget with autofill capability. She pointed out the carousel feature for the main banner which will rotate top level activities that are of interest in the general STEM arena. Another element modern sites have in common is drop down menus with logic built into them. In the OSTEM portal, users will be able to narrow results based on topics of interest and audience. Ms. May stated that all the functions will apply on a cell phone screen. Dr. Darryl Williams asked about analytics, and if the team knows if students are visiting sites and if sites are actually being used. Ms. May responded that they ran Google Analytics on nasa.gov webpages and also noted they are not able to collect data on the user but they can see what is trending. Dr. Williams also commented the younger generation uses Snapchat and Instagram and that the group should do a deeper dive for where younger students are. Ms. May commented her team is looking into Instagram. Twitter is an older technology. The educator community uses Pinetrest and YouTube goes across both student and educator launches. NASA STEM Engagement is moving away from Facebook to Instagram, trying to tailor those accounts for the younger users. Ms. May commented the intent is to launch the new design by the end the year. Mr. Kincaid also noted that the look is different from the rest of NASA.gov and as such, Office of STEM Engagement is requesting the Office of Communication comment on it. Mr. Dumbacher asked about how educators and students have been involved in the design and how will people know this new site exists. Mr. Kincaid responded that they are working with Office of Communications and making full use of the Agency's social media accounts. Ms. May also noted that in previous years the team conducted usability studies and that they kept the data. They have not been able to conduct studies in recent years because of funding constraints. The team has a faculty fellow who is a high school physics teacher who comments on how he is using the tool. The team also communicates with NASA interns about intern usage of the portal and conducts their own research. Nielsen stays up on trends and use of mobile devices. Approximately 50% of people are coming to web site versus using mobile devices.

Partnerships and Space STEM Forum

Mr. Kincaid shared the background for Space STEM Forum. NASA brought together approximately 20 partners that are conducting activities to commemorate Apollo's 50th. He shared the new website which provides a list of activities happening in regions across the country. Mr. Kincaid noted that the intent is to connect the dots of things that are happening across the country. Dr. Girten shared the National Moon Day and Night at a Museum initiative. Over 100 museums throughout country are having activities the night before or the day and night of the landing. Some museums will stay open late in recognition that the Apollo moment started at 4 pm in the afternoon and went to about 11 pm. Dr. Girten noted OSTEM will leverage this event to talk about upcoming Moon to Mars initiatives using the Moon and Apollo events as a springboard. NASA TV will have a two-hour broadcast on July 19, 2019 with the Air and Space Museum. There will be resources for museums and youth serving organizations. There will be a common learning module and resource inventory to ensure there is no duplication of effort. OSTEM is particularly interested in learning resources on that emphasize the Lunar Gateway, lunar exploration and making the connection of Moon to Mars.

Dr. Girten then shared the National Space STEM Challenge initiative. OSTEM is working with ProjectBoard, an Engineering.com group, on the creation of the challenge platform. The National Space STEM Challenge will encourage and reward middle school students for engaging in a variety of STEM activities throughout a one-year period. Dr. Girten also shared the Forward to the Moon Initiative which is intended to help people understand what NASA means by The Next Giant Leap. Dr. Girten explained the NASA Administrator prefers the term “Forward to the Moon” over “Return to the Moon”. She shared that the learning modules that will be shared during the 50th anniversary celebrations will be a balance between Apollo historic, Earthrise, Moon landing, and the Apollo 10 Snoopy Connection and the Space Launch System, Orion, the Lunar Gateway and the sustainability of human habitation and research in the lunar orbit. Dr. Girten shared an activity for sending your name to Moon, similar to sending your name to Mars on a microchip. This concept includes a Boarding Pass and frequent flyer miles. Every time another segment is added to the Lunar Gateway, participants will get more miles. This activity can be very effective around globe, not just in the United States. Other activities will address the concept that the Lunar Gateway is a shortcut to Mars. Dr. Girten shared partner initiatives including Boeing plans to refurbish a Saturn v rocket, live video streaming of the US Space and Rocket Center simultaneous rocket launch and potential activities with the Boy Scouts of America during the July 2019 World Scout Jamboree. Dr. Fortenberry asked for clarity on the concept of Moon to Mars. Dr. Girten explained one of the questions commonly asked is about the difference between the Apollo era and Forward to the Moon. The difference between the two is sustainability and the ability to commute back and forth between the Gateway and the lunar surface. Scientists and engineers have determined that building the Lunar Gateway will help us get to Mars faster and safer. Building the Gateway will enable us to do some of the research needed to get to Mars, for example, long term exposure to radiation. Mr. Dumbacher added we are extending the human neighborhood from low earth orbit to the moon and eventually to Mars and that we will be bringing resources from the Moon for sustainability on Mars.

Performance and Evaluation

Mr. Rick Gilmore updated the group since the August meeting. The evaluation team formalized the strategy into a Learning Agenda. The Office of Management and Budget (OMB) encouraged the Learning Agenda to formalize an evaluation strategy into learning questions and then pull all the information together to make decisions moving forward. As a result, OMB asked OSTEM to share during OMB’s Community of Practice meeting this past October. The evaluation team hosted the meeting at NASA Headquarters and presented to approximately 60 people from Federal agencies. Mr. Gilmore discussed training modules for how the learning agenda fits within the Office of STEM Engagement. Modules are rolling out to activity managers at NASA Centers. Dr. Kennedy asked Mr. Gilmore to talk about how the evaluation and performance monitoring aligns with the Federal STEM plan accountability sections. Mr. Gilmore explained that several NASA folks were involved in writing the accountability section of the plan. Much of it came from America COMPETES and other studies. NASA will have a portfolio to demonstrate success and a strategy to collect, verify and validate data. They are working closely with other agencies to develop an Implementation Plan to achieve the goals of the strategy. Dr. Michael Lach referenced the Administrator’s personal story about what inspired him and stated that many scientists and engineers have similar stories. We don’t know enough about what happens cognitively to create those sparks. Dr. Lachs suggested doing a literature review or analysis to understand what it means for child or undergraduate to be activated or sparked.

Mr. Gilmore noted that the team has worked internally and consulted other Federal agencies around kinds of work Office of STEM Engagement is engaged in to focus in on goals and measures for fiscal years 2019 and 2020. He stated they are looking at everything from an evidence base. Everything Office of STEM Engagement does has to be tied to literature. They are also looking at the quality of the STEM experience using existing tools, for example, the Harvard University twelve dimensions of success rubric. Students going beyond following rote instruction to doing STEM activities—collecting data, recording data, and engaging subject matter experts.

OSTEM Business Service Assessment & Strategy, Space Grant Funding Model, NextGen Pilot

Ms. Kris Brown, Deputy Associate Administrator for STEM Engagement, discussed the Business Services Assessment (BSA) that looked at education and public outreach from an Office of STEM Engagement lens. The BSA provided a set of recommendations on education and public outreach. The process then asked offices to go through a detailed roadmap – to identify those transformational changes that are taking place. In FY18 there was a lot accomplished but for FY19, we need to look at the systemic changes that need to take place, the implementation phase. NASA’s contribution to the larger STEM ecosystem is actually very small. The question is how we work with others to make a larger contribution, how are we going to be aligning Mission Support Architecture Program (MAP) with existing BSA transformations. Office of STEM Engagement brought on Elaine Ho to facilitate MAP. Ms. Brown clarified that MAP is an Agency-wide effort, not just the Office of STEM Engagement.

Dr. Girten updated the group on the NextGen Pilot. NextGen STEM is an extension of the STEM Engagement and Accountability Project (SEAP). NextGen looked at Agency themes and is aligning them to expand reach. There is a lead Center and supporting Centers for each of the three pilot activities: Flight-focused “Small Steps to Giant Leaps”; Commercial-focused “Developing Commercial Crew Capabilities”; and Transportation System-focused “Moon to Mars.” Dr. Girten explained the activities are primarily for formal education with some for informal education settings. Mr. Kincaid added that it is being developed for middle school grades but things are still evolving.

Feedback and Input on Update

Dr. Fortenberry asked if there are alignments to national and state standards that given the middle school target along with formal and informal education settings. Dr. Girten responded that the ten Centers across the country are focusing on Center-specific activities which will be the first approach to align themes and national standards. This is necessary to ensure teachers can leverage the resources available to them. Dr. Lach commented on the psychology of the “spark” and that the group needs to be thinking about the vehicles that deliver the sparks. A lot of the work might be for targeted audiences, but there are other audiences out there that we are not reaching. What is the vehicle for delivering the best spark? Dr. Williams noted literacy components are tied to engagement and that we need to look into what creates the hooks for formal and informal education. Dr. Kennedy asked about the Agency’s appetite for doing things that are innovative. Dr. Lach encouraged the Office of STEM Engagement to look at scale – what is the right thing we can do to scale? Is it using other social media channels? Is it talking to educational institutions about using their spaces for talks? Mr. Kincaid commented that we need to figure out the right avenue to facilitate the spark.

Discuss Findings and Recommendations

Dr. Kennedy stated the group will align findings and recommendations. The group will work together to

propose recommendations to the NASA Advisory Council. Dr. Girtten noted the recommendations should be actionable and include a list of reasons and consequences.

The STEM Engagement Committee discussed and agreed upon two recommendations, one finding and one observation to bring forward to the NASA Advisory Council:

Short Title of Recommendation #1: Federal STEM Plan

Recommendation #1: We recommend that NASA fully engage in its responsibilities outlined in the Federal STEM plan.

Major Reasons for the Recommendation: As a result of their work, NASA has a unique opportunity to inspire the country, and to broaden participation in the future STEM workforce. The agency has extensive involvement in leadership of the plan. Administrator Bridenstine co-chairs Co-STEM, and Associate Administrator Kincaid co-chairs FC-STEM. As a federal agency, NASA is required to participate in the STEM plan, and NASA agreed to be a contributor for three of the nine objectives in the Plan.

Consequences of No Action on the Recommendation:

Not only would NASA be out of compliance, but more importantly, the opportunity to inspire and catalyze the country around the exciting work of the Agency would be wasted.

Short Title of Recommendation #2: Spark that Leads to Engagement

Recommendation #2: The Office of STEM Engagement should create a deep and comprehensive document that describes what we know about sparking student interest (spark), STEM engagement, and motivation, and use it to create the foundational evidence for the Office.

Major Reasons for the Recommendation: NASA is uniquely positioned to inspire and motivate the country with their work. As good stewards of a limited budget, NASA strives to maximize its investments. If NASA could better understand spark, STEM engagement, and motivation, it could be more effective—basing investment decisions on evidence of what works. The Committee feels there is sufficient ambiguity in the field about spark, STEM engagement, and motivation that the Agency should invest in a deeper review of the evidence-based strategies and practices that promote spark, STEM engagement, and motivation.

Consequences of No Action on the Recommendation: Lack of action on this recommendation relegates NASA to using secondary indicators of effectiveness, and could lead to less effective investment decisions. NASA will have limited impact, and will be at greater risk of duplication of ineffective activities.

Finding #1: The Office of STEM Engagement is taking steps to identify and amplify NASA's unique achievements.

Major Reasons for the Findings:

Information presented and progress made on the following topics:

- Space STEM forum
- Website redesign
- Aligning with and co-funding STEM activities with the Space Technology Mission Directorate (STMD)
- Consolidation of program management of Minority University Research and Education Program (MUREP), Established Program to Stimulate Competitive Research (EPSCoR) and Space Grant for the express purpose of increasing knowledge sharing across the programs.
- Integration of STEM engagement activities across the three programs above—and NextGen STEM

Observation #1: The budget and statute that governs the Office of STEM Engagement appears to limit their ability to nationally scale their programs and outreach. The majority of the budget allocated to the Office of STEM Engagement is partitioned to specific categories of institutions and programs. The committee plans to learn more about the current efforts of the Office to achieve national scale, and recognizes that understanding evidence-based practices for sparking STEM engagement and motivation is a critical first step in the discussion around scale.

Adjourn Meeting

Dr. Girten then adjourned the meeting.