



Museums for America

Sample Application MA-260425-OMS-26
Project Category: Community Engagement

University of North Carolina at Chapel Hill, Morehead Planetarium and Science Center

Amount awarded by IMLS:	\$273,534
Amount of cost share:	\$386,081

The Morehead Planetarium and Science Center at the University of North Carolina at Chapel Hill will promote public engagement with science by engaging communities with the scientific, technological, and human dimensions of NASA's Artemis missions to the Moon. Morehead will work with the Institute for Learning Innovation to design, test, and evaluate a strategy for engaging audiences with Artemis-related learning experiences, with a focus on 8–13-year-old youth with Autism Spectrum Disorder (ASD) and Informal Science Learning educators. Project activities will include formative research, community focus groups, and pilot programming to develop educational resources that will be implemented at Morehead and shared with museums and science centers throughout North Carolina. The project team will also engage an exhibit developer to prototype interactive moonscape exhibit experiences and a media production company to create programming for the planetarium theater. The project will strengthen institutional capacity to engage audiences and foster collaboration among museums and science centers.

Attached are the following components excerpted from the original application.

- Narrative
- Schedule of Completion
- Digital Products Plan
- Performance Measurement Plan

When preparing an application for the next deadline, be sure to follow the instructions in the most recent Notice of Funding Opportunity for the grant program to which you are applying.

Project Justification

What do we propose to do?

The NASA Artemis Mission to the Moon is reinvigorating the world's fascination with human space exploration, igniting excitement among people of all ages. Artemis will showcase NASA's critical and cutting-edge technologies, revealing a blueprint for sustainable long-term human space travel - a necessary next-step for a human mission to Mars. Artemis will test the potential for deep-space technologies, cultivate international collaboration, and drive major economic activity and scientific discovery. Given the high level of importance to current and future global societies, and the potential for sustained public engagement with relevant current science, it is essential that museums and science centers have the appropriate tools and training to effectively connect our communities with Artemis missions over the program's multi-year lifespan.

Morehead Planetarium and Science Center (MPSC), located on the campus of the University of North Carolina in Chapel Hill, is deeply woven into the history of NASA's first race to the Moon. We trained the Gemini, Mercury, and Apollo astronauts in celestial navigation as preparation for their groundbreaking missions. Our history and statewide mandate - *Science for All* - along with our current ties to Artemis astronaut Christina Koch and UNC alumni and astronaut Zena Cardman, make MPSC the ideal launchpad for statewide community engagement with Artemis. Christina Koch's statement that childhood field trips to Morehead inspired her dream of going to space turns the international story of Artemis into a North Carolina story worth sharing statewide.

Through the proposed *Artemis for All* project, MPSC, in collaboration with the Institute for Learning Innovation (ILI), proposes to **(1) develop a community engagement plan** that is responsive to the needs of members of our two primary audiences (youth with Autism Spectrum Disorder (ASD) with low support needs, Informal STEM Learning (ISL) educators) which will guide the development, testing, and iteration of project training materials and educational products; **(2) engage youth community members with ASD** in an advisory capacity to influence the *Artemis for All* program content, product design, and exhibit environment; **(3) engage peer museums and science centers** in North Carolina to provide input on local needs and program design; **(4) create and deliver training and support materials to build statewide capacity** for sharing the science of Artemis, particularly youth with autism; **(5) develop, share, and support a suite of statewide learning opportunities** for youth with ASD and members of the public at multiple locations across North Carolina.

Artemis for All will be shaped by the interests, needs, and design requirements of youth with ASD (ages 8-13). By designing educational materials to support inclusive experiences in museum and science center environments, this project will address an inadequately served audience, while strengthening learning environments for all – a key tenant of Universal Design. ILI has extensive expertise working to improve learning experiences for people with ASD and will adapt training tools and resources they are developing as leads of two NSF projects: *Broadening and Sustaining Capacity for Inclusive Informal STEM Learning Opportunities for People with Autism Spectrum Disorder* (e.g., Matthews et al., 2024). This ILI initiative has developed training resources to improve ISL providers' ability to create inclusive environments and engage individuals with ASD that will be adapted for this project. MPSC will build upon a partnership with the UNC TEACCH Autism Program to continue creating sensory-friendly events for local ASD communities. We have already begun developing trust with our local ASD community and are looking forward to collaborating with them on this project. Our second primary audience are statewide educators at MPSC and our ISL partners who will share their needs and receive training to build internal capacity around best practices regarding ASD support techniques and strategies in ISL settings.

The proposed project will develop a "constellation" of learning experiences for participants to engage with the Artemis mission across North Carolina, including new programs, curriculum, exhibit experiences, a planetarium show, and special events like a Moon landing watch party. Provided as part of our cost match will be a large scale (approximately 10'x10') Moonscape model, a tactile interactive depicting the Moon's South Pole and the nine proposed Artemis landing regions (see Supporting Documents for images of Moonscape). The cratered surface will invite visitors to encounter the Moon as a real, physical place rather than an abstract concept. Created using actual lunar topographic datasets, the model of the Moon's surface will be accurate within three meters. **It will compel immediate engagement with the Moon and the Artemis program—inviting visitors to gather, touch, and explore—while reinforcing our commitment to accessible, research-informed science education.** The proposed project activities will support the creation of digital interactives, interpretive panels, and projected media for the Moonscape exhibits—informed by stakeholder feedback—that will layer audio, visual, and narrative elements to deepen learning and understanding of the Artemis program. Using the Moonscape as a

focal point for engagement, MPSC will design interactive programming for youth investigation, experimentation, and even public debate as to the best location for a landing opportunity. ILI will support MPSC in increasing internal capacity to develop and implement formative evaluation practices to better understand community questions and expectations around Artemis, as well as Morehead's perceived and potential role in public engagement, as the mission evolves. Additionally, nine small scale models of each polar landing site will be produced to travel to nine partner institutions across North Carolina, along with accompanying activities.

What need, problem, or challenge will project your address and how was it identified?

As we close in on the countdown to the Artemis II launch, MPSC visitors, classroom teachers, science centers, and members of the UNC campus community have begun asking for educational support surrounding the Artemis program. At the same time, Morehead staff is noting a lack of public understanding around Artemis—a **program that seeks to fundamentally change the way humans interact with space**. MPSC wants to capitalize on this moment to share what we do best with our community, and communities across North Carolina. Morehead is recognized as a trusted source for timely, accurate information about NASA missions and general astronomy content. Leveraging university resources and community partnerships, MPSC and ILI will provide ISL staff training, educational resources, and expertise to support other science centers in responding to community needs.

Another challenge we acknowledge is that informal learning environments often fall short of providing a comfortable learning experience for youth with autism (more on this primary audience below), and learning environments that are described as *fun* and *engaging* by neurotypical youth may be perceived as distracting or uncomfortable by youth with autism. Davidson et al (1991) reported that museum experiences providing different layers of entry or access to content can result in double the average visit time in museums. Designing Artemis learning opportunities with intentional layers of inclusion can lead to higher levels of interest for all visitors and positively influence learning outcomes. By engaging youth with autism to shape exhibit and program design, and through educator training and sharing *Artemis for All* program materials, we aim to improve MPSC's and partners' ability to create inclusive environments and provide positive learning experiences for individuals with ASD.

The Institute for Learning Innovation is an ideal partner for this project. Recent staffing challenges throughout the university have led to overall reduced capacity within the MPSC team at a time when we are seeking to increase and sustain engagement statewide and improve the inclusive nature of our programming, as part of our *Science for All* mission. ILI is uniquely suited to support MPSC staff in the formative evaluation and development of programs and exhibit experiences that could enthrall and engage audiences. ILI also has relevant expertise (e.g., Matthews et al., 2024) in working with youth with ASD and working with museum staff to shift organizational practice to support visitors with autism. The ILI team will build internal capacity within MPSC to design and conduct focus groups and respond to their input. ILI will also build internal capacity for the education staff at Morehead and at partner organizations to better support youth audiences with ASD statewide.

Who is the primary audience for your project and how have they been involved in planning?

The first primary audiences for this work are elementary and middle-school-age youth (ages 8-13) with autism spectrum disorder (ASD), specifically youth with low-support needs. The CDC reports that 1 in 31 eight-year-old children in the United States have an ASD diagnosis, with prevalence varying by race and geographic location (Shaw et al., 2025). ASD is a developmental disorder which may be characterized by impaired social communication and social interaction skills, restrictive patterns of interest, and repetitive behaviors (American Psychological Association, 2026). While it is well-understood that ISLs can greatly increase youth interest, knowledge, and self-efficacy for neurotypical participants (e.g., Falk & Needham, 2011), programs and exhibits that are inclusive in their design are also likely to be highly impactful for individuals with ASD. Free-choice learning environments are particularly important for youth with autism as they are typically designed so for the learner to choose content that aligns with their personal interests, and can choose to engage in the ways that appeal to them (i.e., verbal, hands-on, fast or slow, social or solitary, directed or inquiry-based, etc.). This is consistent with evidence-based approaches for autism intervention (e.g., Koegel & Koegel, 2012). Informal learning spaces also importantly offer opportunities for youth with autism to practice interacting with neurotypical peers with a shared interest, which supports developing social interaction skills (Yuen et al., 2014) as well as interest and engagement in STEM learning (Lindsay & Hounsell, 2017). Unfortunately, museum staff and parents of youth with autism often differ in their perception of the quality of the museum experience for youth with autism (e.g., Kulik & Fletcher, 2016). Our approach in this project is to engage 20 youth with autism in an advisory capacity, through online or in-person focus groups or interviews (their preference), to learn about their interests and specific questions related

to the Artemis missions, the appeal of various proposed exhibit experiences, their ideas for the exhibit, and their preferences and requirements for engaging with the exhibit. We anticipate in the last eighteen months of the project, 13,500 youth age 8 to 13 will engage with the *Artemis for All* programs on-site through field trips and estimate that more than 435 of those participants would be youth with diagnosed ASD, and likely more with undiagnosed autism (Shaw et al., 2025). As we do not plan to ask any youth participant to disclose a medical diagnosis, data to track project results for this primary audience will be collected at specific time points, such as events that are designed for the ASD community (e.g., sensory-friendly events).

The second primary audience for this initiative is ISL educators at Morehead and the nine partner institutions across the state who will deliver the *Artemis for All* programming to public audiences. We will provide onboarding and feedback opportunities early in the project period for education staff to surface their programming interests and training needs (about Artemis, and working with youth with ASD), and we will develop the program materials and training experiences with this input in mind. MPSC is a member of the NC Science Network, a collection of over 50 science centers, museums, and nature centers in partnership across the state. NC Science Network organizations will be invited to collaborate with MPSC and ILI on the *Artemis for All* project.

Who are the ultimate beneficiaries for this project?

It is estimated that over 750,000 North Carolinians could benefit from the *Artemis for All* project. Participants would be general visitors of all ages and backgrounds either attending science centers or museums across the state or receiving programs through MPSC's science programming outreach initiatives (see table below).

Artemis for All Project Elements: Estimated General Attendance #s and Participation of Target Audiences (18-month)	Total # public visitors served (# of youth age 8-13 served)	Estimated # of youth within ASD community (Calculation based on ratio of 1 in 31 ASD youth following Shaw et al., 2025)
Moonscape tactile interactive onsite (exhibit)	48,000 (13,500) **360 (180) at sensory night	435 **180 youth at Sensory nights
Artemis Landing site mini-Moon offsite interactives (exhibit and programs at 9 partner sites)	Potential for >500,000	Potential for >16,000
Artemis Mission Landing Parties (including 9 partner sites)	1300 (500)	16
Fulldome Planetarium show onsite and offsite (programs)	6,000 (4,500) **360 (180) at sensory night	145 **180 youth at Sensory nights
Curriculum supports for Artemis Mission – activities distributed freely on website, included in Duke Energy Kits and Star Party Kits, and as an onsite activity	(Potential for >150,000)	Potential for at least 4,800

Special attention will be given to our primary audience, youth (ages 8-13) with autism spectrum disorder (ASD). We also anticipate thousands of children within the ASD community will benefit from this project. In addition, ten NC institutions, including Morehead, will engage in staff training around facilitating the materials and activities, particularly for youth with ASD in their communities. These sites will also benefit from increased internal capacity to respond to milestone events in space exploration and to design programs for community members with autism.

How will your project advance our institution's strategic plan?

Morehead's mission is "to serve North Carolina and beyond by bringing together the unique resources of the University of North Carolina at Chapel Hill to engage the public for an enhanced understanding of science." Our mission reflects MPSC's focus on public engagement, accessible science education, and leveraging university strengths to broaden scientific understanding for diverse audiences. We are committed to bringing high-quality STEM opportunities to children and families in all 100 North Carolina counties. MPSC values engaging people in authentic partnerships and active learning experiences, which includes strong collaborations within the university community, as well as partnerships that span the state and nation. Additionally, *Artemis for All* plays to our expertise in participating in and sharing space exploration frontiers with broad audiences.

Which program goal and associated objective of MFA will your project address?

Artemis for All supports MFA program goals by strengthening community engagement (agency-level goal 2) through activities aligned with Objective 2.1 (support collaborative planning, outreach, and evaluation efforts to improve access and engagement) and Objective 2.2 (support the implementation of community-centered partnerships). Program offerings will be intentionally designed with youth with ASD (low support needs) in mind, with their feedback guiding both exhibit content and the sensory elements of the program (tactile, visual, audio). More inclusive environments improve STEM learning outcomes for neurodivergent youth as well as all community members. The second primary audience, educators at organizations who will deliver the *Artemis for All* programs across the state and host Artemis landing site models, will provide input and influence the design of the program materials through design iterations. The project will also develop two training experiences for these staff members designed to strengthen their ability to support neurodivergent youth and support the implementation of programming in their communities. The webinars will be designed with specific input from the participating educational partners, further supporting community collaboration, and will draw on the expertise of the Neuroinclusive Learning Network (an initiative led by ILI). To expand access across North Carolina, many programs, resources, and exhibits will be designed for direct community delivery through partner museums. Eliminating geographic barriers to access is a key strategy we will employ to promote broad public engagement and participation.

Project Work Plan

Proposed Activities and Sequence

The *Artemis for All* project will create a multi-year community engagement initiative in preparation for landing humans on the Moon during the Artemis IV and V missions in 2028. The project will be responsive to the needs of our primary audience, 8- to 13-year-old youth within the ASD community, as we seek to engage them in an advisory role in the content and design of related informal learning experiences. We will also invite staff from peer museums in North Carolina to provide feedback on their needs for educational resources, experiences, and information about Artemis for their audiences. This formative evaluation structure helps Morehead better understand community questions and expectations around Artemis, as well as Morehead's perceived and potential role in public engagement prior to developing ISL materials.

The resulting input will inform the development of a suite of activities, materials, events, and information used for sustained engagement of North Carolina communities around upcoming Artemis missions. During this process, MPSC will establish a community engagement plan for sharing Artemis with public audiences that will involve all museum departments (e.g. exhibits, programs, communications, membership). We will share this framework, as well as the tools and techniques created from this project, with peer partner museums across the state. The resulting multi-year public engagement plan will provide a "constellation" of ISL offerings, deliberately curated to promote broad public engagement (objective 2.1) as well as support community collaboration and foster civic discourse (objective 2.2). Planning an array of offerings and partnering with ISLs across the state will bring programming to communities rather than only relying on community members to come to Morehead, thereby reducing geographical barriers to access.

Youth Partners. The project will begin in Fall 2026 with recruitment of twenty youth ages 8 to 13, with ASD. Morehead will use several methods for recruiting participants including our ongoing Sensory-Friendly events and partnership with UNC TEACCH Autism Program. Gaining insight and guidance from the ASD community on this work will create a more accessible and inclusive array of ISL experiences, ultimately benefitting all audiences. We will convene these youth in smaller focus groups or offer individual sessions to ensure their comfort throughout the project, and youth will be paid a stipend for their participation. Once the suite of materials is developed and launched (Fall 2027), we will invite our Youth Partners back to Morehead for a preview with their families in the Fall/Winter 2027. In Year 2, we will invite them to return for Sensory Friendly events, themed for an Artemis IV Landing Party.

Partner Museums. We will invite peer museums and science centers across the state to join *Artemis for All* in Fall 2026 and begin onboarding and feedback opportunities in early 2027. MPSC and ILI will recruit museum partners through the NC Science Network and the NC Science Festival. MPSC has strong statewide relationships through both of these groups. Museum partners will meet monthly (virtually) to review Artemis timelines and events (we will be responsive to NASA shifting launch windows), share resources, ask questions, and report on progress. We plan to work with nine partners, matching the nine proposed landing regions on the Moon's South Pole and will collaborate with Dark Skies Studio, LLC in early 2027 of Year 1 to begin fabrication of nine landing site models for

programming. Once all materials have been developed and distributed, MPSC and ILI will continue to hold monthly check-ins to support partners by sharing resources and information. Feedback will be collected through email, virtual focus groups, surveys, and site visits from early 2027 through early 2029.

Morehead Staff. The throughline for this project will be Morehead's development of the framework and the deliverables for sharing Artemis with audiences across North Carolina. Morehead's internal *Artemis for All* team will meet monthly throughout the grant period, with the leadership team (Boyette, Corin, Kloda) meeting twice/month. Planning meetings will consider short and long horizons leading up to launches, landings, and return missions and strategize how MPSC will address each opportunity. Staff subcommittees will manage the development of programs, exhibit experiences, events, and communications. The Programs subcommittee will begin work on activities and the planetarium show in early 2027. The Exhibits subcommittee will start work on the Moonscape models at that time. Monthly meetings will create opportunities for enhanced communication and collaboration around the deliverables, essential for efficiency in development.

Artemis Engagement Deliverables. Forming partnerships with youth with ASD and peer museums statewide will help MPSC build statewide capacity for widely sharing the Artemis missions. The creation of focus groups as well as a cadence of meetings with other museum staff will result in shared resources and consistent communication around events that will likely shift due to changes in NASA's timing. In early 2027, we will begin development of activities to engage museum visitors, school groups, and community audiences. We will test, iterate, and refine activities and materials throughout Spring and Summer 2027. Delivery of the suite of statewide learning opportunities to partner museums is planned for Fall 2027 and ensures we have ample room for curriculum and ASD support training sessions. Partner museums will also want to have these materials several months out from the projected Artemis IV launch to plan their strategies for engagement.

Who will plan, implement, and manage your project?

Dr. Todd Boyette (PI) will provide overall leadership for the project, supervise implementation of the Artemis engagement initiative, coordinate statewide partnerships, and oversee dissemination of project outcomes. As Director of Morehead Planetarium and Science Center and an Adjunct Professor at the University of North Carolina at Chapel Hill, Boyette brings extensive experience leading informal science education initiatives and federally funded projects. **Michele Kloda (co-I)** will coordinate project implementation and lead development of the project's interactive exhibit and engagement experiences. As Director of Innovation and Design at Morehead, she brings extensive experience in exhibit development and inclusive museum learning environments. **Whit McMillan** will lead development of educational programs and curricula related to Artemis mission themes. As Manager of School and Public Programs at Morehead, he oversees planetarium programming, outreach programs, and curriculum development for diverse audiences. **Nick Eakes** will assist with the development and implementation of outreach programming and digital content. As a Science Education Specialist at Morehead, he manages mobile astronomy outreach programs serving communities across North Carolina and supports digital planetarium programming. **Melanie Hatz Levinson** will provide exhibit design and development services for the project's interactive moonscape exhibit experiences and related interpretive components. With more than thirty years of museum experience and leadership roles in museums, she brings extensive expertise in exhibition development and visitor-centered learning environments. **Horizon Productions, Digital Fulldome Media Production** will create digital fulldome media assets that support immersive storytelling around the Artemis missions. These assets will be used in Morehead's planetarium theater and as part of the Moonscape digital interactive experience. **The Institute for Learning Innovation** will serve as the project's external evaluation and community engagement partner. ILI will design and implement the project's performance measurement plan, conduct stakeholder engagement activities, inform design, and analyze project outcomes. Evaluation activities will include focus groups with neurodivergent youth, consultations with partner organizations across North Carolina, and ongoing data collection and analysis aligned with IMLS performance measures. **Dr. Elysa Corin (co-I)** will lead evaluation activities and provide expertise in mixed-methods evaluation, informal learning research, and astronomy education. **Dr. Monae Verbeke** will contribute expertise in engaging neurodivergent youth and inclusive learning practices, while **Shama Lakdawala** will coordinate evaluation logistics and data management.

What are the risks to the project and how will you mitigate them?

Morehead and ILI bring extensive experience from past IMLS and federally funded projects, informing our approach to project risks. We have identified three primary considerations: (1). Last-minute Artemis launch or

landing changes may disrupt planned public events; we will address this uncertainty with our focus groups, statewide partners, and within the programming itself. For example, we may focus primarily on landing events which are more predictable. (2). Adverse mission events that are catastrophic and potentially traumatic to communities, particularly those engaged in learning about Artemis, will need to be addressed. We will develop a response plan with input from our peer institutions and rely on university expertise to support audiences processing a difficult outcome. MPSC has a deep bench of university resources with expertise to help us appropriately address community trauma. (3). The possibility of a building closure in Year 3 to begin an internal renovation of our Planetarium theater would affect our onsite plans for engagement. While this is unlikely, if we are in this situation, we have a plan to focus on our established outreach program, utilize our portable domes for the planetarium show and travel the Artemis landing site models and the Moonscape exhibit to centers and museums across North Carolina. If our building is temporarily closed, Morehead will bring the Moon to you!

What time, financial, personnel, and other resources will you need to carry out the activities?

The *Artemis for All* project will build Morehead's institutional capacity to design, implement, and evaluate a multi-year strategy for public engagement with NASA's Artemis missions. Budgeted resources support project leadership and program development, expert exhibit and digital media prototyping and production, external evaluation and stakeholder engagement, travel for partnership coordination, materials for exhibit and program prototyping, and fabrication of a culminating interactive exhibit (cost share). Total project costs are **\$659,615**, including **\$273,534 in requested IMLS funds and \$386,081 in institutional cost share**.

How will you track progress toward intended results?

This project will employ several strategies to ensure the project tracks progress effectively, is responsive to emerging findings, and meets its goals. As outlined in the performance measurement plan, we will collect data regularly on project progress, for example through L10 meeting tracking tools that will be filled in twice/month by project leadership to capture progress towards project milestones, monthly check-in surveys filled in by all project team members (MPSC and ILI), and regular memos prepared by Co-I Corin that will summarize these data and contribute to progress monitoring.

Project Results

What are your project's intended results? How will they address the need, problem, or challenge identified?

This project directly advances MFA community engagement goals by advancing efforts to improve access and engagement for community members (objective 2.1) and efforts that support community partnerships, exhibitions, and programs (objective 2.2). We aim to expand MPSC's capacity—and that of ISL partners statewide—to engage communities across North Carolina in conversation about the historic return of humans to the Moon with a focus on supporting access and engagement for youth with autism. To do this, we will develop a suite of learning experiences (exhibits, programs, curriculum, planetarium show, etc.) that highlight Artemis missions and respond to the preferences, needs, and requirements of youth with ASD. By involving youth with ASD in the design process, we will create resources that increase participation, comfort in ISL spaces, and positive outcomes such as belonging, enjoyment, and learning. We also aim to understand whether the educational experience we provide meets their expectations, while increasing their sense of self-efficacy to engage with STEM content in ISL settings, their interest and understanding of Artemis, and their interest in engaging in future STEM learning (including about Artemis). The project's intended results also include the increased capacity by ISL staff for community engagement across the state, focusing on improving educators' ability to support individuals with ASD in their local communities and increasing capacity to provide learning activities pertaining to the Artemis missions. **Taken together, project results address the main challenges identified: (1) responding to time-sensitive community needs (and requests) by creating a statewide education program about Artemis, (2) increasing the capacity of MPSC and ISL education staff across the state to deliver learning opportunities about Artemis through training and resources, (3) increasing staff capacity to support youth program participants with autism through training and resources, and (4) meeting youth's expectations and improving learning experiences and outcomes for youth with autism who participate in our programs.**

How will the knowledge, skills, behaviors, and/or attitudes of the primary audience change because of your project?

Youth outcomes. Through participation in Artemis for All programs and exhibits at MPSC and partner sites, youth with ASD are expected to show positive shifts in attitudes and behaviors. These include improved understanding of

the Artemis mission, greater confidence in engaging with STEM content in ISL spaces, increased comfort and enjoyment in exhibits and programs, and stronger interest in future Artemis-related activities (e.g., attending additional programs or exploring related resources).

ISL Partner outcomes. Following the trainings and resource sharing, ISL educators will increase their knowledge of the Artemis missions and their confidence in delivering related programming to the public. Educators will also grow their understanding of autism spectrum disorder, strengthen their skills for supporting STEM learning for individuals with ASD, report more positive attitudes toward using these strategies, and engage more frequently in practices that support ASD learners.

What products will result from your project, and how will you make them accessible to the primary audience?

The project will create a large Moonscape model (cost match) with related digital interactive components, nine small Artemis landing site models and related programming, a full-length (~45 minute) live planetarium show about the Artemis mission to be offered at Morehead's Fulldome theater and in two portable domes available to travel across the state, and Moon- and Artemis-themed activities aligned with 3rd-6th grade curriculum. All programs will be available to the public, and accessible for youth with ASD (primary audience) and may be booked by a private group (e.g., school field trip). Additionally, the project will develop two trainings for museum partners (primary audience), one focused on building capacity to engage ASD audiences and one introducing Artemis mission content, project resources, implementation support. More detail on the exhibits and programs follows:

- The **Moonscape exhibit** and the **mini-Moon Artemis landing site models** will be open at the start of project Year 2 (late 2027). MPSC holds sensory-friendly events multiple times throughout the year (quarterly). In partnership with the UNC TEACCH Autism Program and the local autism community, these events are designed with and for community members with ASD and will be a key opportunity to engage youth with ASD. Through the training process, we will encourage our nine partners to advertise the Artemis programming as sensory friendly or to host a sensory-friendly event to encourage participation of youth with ASD and their families, and we will provide support on how to do so.
- **Curriculum with activities for youth** will be available through on-site programming at Morehead, outreach activities, and specific webpages dedicated to *Artemis for All*. Online activities and resources will provide access and support for partner sites, North Carolina schools, as well as homeschool audiences. We will intentionally market and share all activities with educators, parents, and organizational partners working with youth with autism (low support needs). In addition, activities can be distributed through existing MPSC offerings such as by mail and online within the Duke Energy Science Night program or through Statewide Star Party resources.
- **Planetarium shows** will be made available for reservation through Morehead School Programs operations and scheduled regularly through public showings in the Planetarium. Planetarium shows will also be included in Artemis related events held at Morehead and added to the portable planetarium systems and made available throughout the state.

How will you sustain the benefits of your project beyond the conclusion?

This project will strengthen ISL staff capacity for future work by providing professional development on best practices for engaging learners with ASD in informal science settings. MPSC and partner museum staff will also receive training on Artemis program materials and related educational products which we expect will continue to benefit the public beyond the grant period. By the end of the project, MPSC and ILI will have developed a community engagement model for major science events such as lunar missions, and we will have built effective collaborations with museums and science centers across North Carolina. These partnerships will enhance MPSC's ability to engage communities with the science and stories of space exploration. We will continue nurturing these relationships through ongoing statewide initiatives led by MPSC including the NC Science Festival (annual) and the Statewide Star Party (annual).

For youth with ASD, gaining confidence and experiencing success in ISL spaces can increase their motivation to seek additional STEM-learning and social engagement opportunities. Building key skills, such as interpersonal communication, supports youth with autism in participating more fully in learning environments and helps prepare them to explore STEM for enjoyment, academics, and future careers.

Schedule of Completion – Artemis for All: September 1, 2026 – February 28, 2029

[illegible]

Digital Products Plan - Artemis for All Proposal

What type of digital products will you create?

- One “live” planetarium show for Morehead’s Fulldome Theater and Portable Planetarium Program. The show will be formatted in 4K using the SkyScan digital system Dark Matter currently used in the Fulldome Theater at Morehead and in current Digitalis software for the portable domes.
- At least one digital interactive using a touchscreen interface that helps visitors more deeply engage with/understand the Artemis Landing Sites featured on the large-scale tactile Moonscape. Horizon Productions will work with MPSC and ILI to create this interactive.

How will you make your digital products openly available?

- The planetarium show will use digital imagery that is part of our technical systems. It will not be designed as a type of show that we normally package and share with peer institutions. We are amenable to sharing the show script so that other planetariums can use the information and build their own visualizations.
- We would share the Artemis Landing Site digital media interactive with peer institutions (museums, science centers) who are interested and have the appropriate hardware.

What rights will you assert over your digital products, and what limitations, if any, will you place on their use?

- We would not have any limitations on use. The user must credit Morehead Planetarium and Science Center. The user must not monetize the digital product for any reason.

Will your products implicate privacy concerns or cultural sensitivities, and if so, how will you address them?

- We have no concerns.

How will you address the sustainability of your digital products?

- The live planetarium show will be presented through 2029 with updates throughout this time as the Artemis missions change. The script will be long-lived as a digital file. We will archive the primary script and then update versions over time.
- The digital interactives will also last through the Artemis missions, but we plan to update them as information changes. They are not intended to be permanent. Morehead has access to servers where the media iterations will be stored. Storage of digital media is common practice for Morehead.

Applicant Name: Morehead Planetarium and Science Center (UNC-Chapel Hill)

Project Title: Artemis for All

Performance Measure	Data We Will Collect (e.g., counts, costs, weights, volumes, temperatures, percentages, hours, observations, opinions, feelings)	Source of Our Data (e.g., members of the target group, project staff, stakeholders, internal/external documents, recording devices, databases)	Method We Will Use (e.g., survey, questionnaire, interview, focus group, informal discussion, observation, assessment, document analysis)	Schedule (e.g., daily, weekly, monthly, quarterly, annually, beginning/end)
Effectiveness: The extent to which activities contribute to achieving the intended results	During the first/second year of the project, ISL education staff at MPSC and partner organizations will participate in a pre- and post- survey before and after they participate in the two capacity building trainings. One training (and survey set) will collect data on educators' content knowledge related to Artemis, and their confidence in their ability to deliver programming about the Moon and Artemis to the public. The second training (and survey set) will collect data on educator's knowledge of ASD, knowledge of how to facilitate STEM learning for people with ASD, current practices, and confidence and interest in employing strategies at their organization to support learners with ASD, etc. The ILI team will design and employ exit surveys and post-program participation surveys to gather feedback from youth participants with ASD and their family members at 1) MPSC and 2) partnering ISL locations. • Several times per year (quarterly) MPSC hosts sensory days and opens after regular public hours to welcome neurodivergent guests and their families. At the exit to the Moonscape exhibit visitors will be invited to provide feedback through an exit survey (facilitated by a staff member or family member). For individuals who attend the <i>Artemis for All</i> planetarium show, feedback surveys will be collected onsite or by email (for individuals who purchased tickets online). • ISL partners will be asked to provide exit surveys to youth who participate at their locations during specified sensory-friendly programs. Surveys will include questions pertaining to visitor feedback on the exhibit/program design, their perception of the impact of the program on them, their perception of their ability to engage with STEM content (e.g., self-efficacy), attitudes towards Artemis, and an interest in engaging in future learning related to Artemis. • More data may be collected if additional education offerings are created in response to community needs. Throughout the project period, participant numbers across the project's educational offerings will be counted through MPSC's existing organizational practice with support from the science center's operations department. At the end of the project, a survey will be shared with education staff at partner sites to record the number of people served, number of youth with ASD served, and perceived impacts on their visitors. This survey will also serve as an extended-post test, complementing data collected after the two trainings, and contribute to the assessment of effectiveness to improve educator knowledge and confidence teaching about Artemis, as well as knowledge of ASD, how to facilitate STEM learning for people with ASD, confidence and interest employing strategies to support learners with ASD, etc.			

Efficiency: How well resources (e.g., funds, expertise, time) are used and costs are minimized while generating maximum value for the target group	Monthly, all team members involved in the project (MPSC and ILI staff) will fill out a check-in survey. This tool, designed to take less than 10 minutes to complete, will identify what is going well, points of concern, and where resources (e.g., staff expertise, time) may need to be re-allocated. Co-I Corin will summarize these data in a monthly memo and share back with the leadership team to help gauge project efficiency. Twice per year the PI, with support from project Co-I's, will assess project spending on a per-organization basis and compare it with the quarterly L10 reports (detailed below) of project progress to provide a measure of project efficiency.
Quality: How well the activities meet the requirements and expectations of the target group	In year one the ILI team will conduct focus groups with twenty youth (ages 8-13) with ASD and seek input into their interests, expectations, preferences, and requirements for the exhibit and programs. Feedback will be used to create a framework that will guide product development that is responsive to youth specifications. At key development moments, the ILI team will use this framework to check in with the design team about the direction of project products and compare against target group expectations and requirements. The youth will also be engaged in month 7/8 of year 1 to respond to prototypes in development and provide feedback on alignment, and at the end of year 1 to experience and provide feedback on the final products. In year one the ILI team will offer feedback opportunities (e.g., focus groups) with education staff at partner ISL organizations that will host the tactile landing site models and accompanying programs to seek input into program design and content, as well as their experience with, comfort with, and support needs for facilitating learning experiences for youth with ASD. These data will inform development of educational products and educator trainings to align with needs and expectations. In year two, after education staff participate in the capacity building trainings, they will take a post-survey (described above). At this opportunity we will also collect feedback to measure satisfaction with the trainings, the extent to which staff perceive the trainings to meet their needs and identify remaining questions and additional opportunities for staff development. An exit survey will be used to gather feedback from individuals with ASD who engage with the Moonscape, attend the planetarium show, and participate at partner ISL site locations (described above). At these opportunities we will also collect visitor feedback on their experience of the exhibit/program, including whether the experience meets their expectations, as well as questions designed to collect feedback on product alignment with specific requirements surfaced during the youth focus groups.
Timeliness: The extent to which each task/activity is completed within the proposed timeframe	At bi-weekly meetings, the project leadership team (PI Boyette and Co-I's Corin and Kloda) will utilize the L10 meeting tracking tool to report and evaluate tasks, issues, successes, and progress towards quarterly goals and timelines. The L10 tool is utilized by several ILI project teams to have a running record of the project's progress in meeting project goals and smaller milestones. Quarterly, Co-I Corin will review the L10's to develop a project report and to determine the extent to which the project is meeting the proposed milestones. The project leadership team will use this tool to assess the fit between the proposed project timeline and actual completion dates.