

Fermilab Education and Public Engagement Strategic Plan

December 2nd, 2020

Fermilab Office of Education and Public Engagement Mission Statement

Fermilab is America's premier particle physics and accelerator laboratory. We bring the world together to solve the mysteries of matter, energy, space and time. We lead the world in neutrino science, lead the nation in the development of particle colliders and their use, and advance physics through measurements of the cosmos.

The Fermilab Office of Education and Public Engagement shares the science of Fermilab through active engagement and learning to a diverse and inclusive audience, while showcasing the arts and stewardship of the environment. We use Fermilab's advances in science and technology to improve audience understanding and appreciation of the natural world and Fermilab's mission. Using cutting-edge research with regard to how students learn and employing best practices in science communication, we provide opportunities for learners of all ages and backgrounds to engage with Fermilab's science, technology, art, environment and the people who shape those areas.

We serve as the link that connects audiences to Fermilab's mission to understand the mysteries of the universe because we believe knowledge gained at Fermilab is essential to understanding our world.

Introduction

Fermilab is America's particle physics and accelerator laboratory with a vision to solve the mysteries of matter, energy, space, and time for the benefit of all. Just as Fermilab is on the cutting edge of science, Fermilab Education and Public Engagement (EPE) strives to be on the cutting edge of public engagement and education. This strategic plan outlines specific goals, guiding principles, actions to achieve the goals, and evaluation criteria to assess progress toward each goal. Diversity, equity and inclusion (EDI) are foundational principles of this plan. We will work with communities, particularly Black and Brown communities, to serve their needs and ensure full access to Fermilab's science through our education and public engagement programs. Fermilab EPE will work as partners in science exploration with the audiences it engages. We seek to engage our local, regional, national and global communities through a variety of efforts, all with a set of foundational principles in mind. We recognize that communities may have different needs and will be reached through different programming and

engagement. An emphasis will be placed on the needs of local communities. Though this document is brief, the process of developing it was not. Input from representatives of each major stakeholder group was considered in formulating the following recommendations, and extensive research was done by task forces focusing on specific areas. Ultimately, Fermilab EPE has a responsibility to put its efforts toward developing programs that offer opportunities unique to Fermilab. There are numerous, excellent opportunities in EPE. Fermilab EPE will focus on programs in spaces that it is uniquely able to fill. Since its inception, Fermilab has welcomed the public to its site, highlighting the amazing intersection between art and science, while also serving as a National Environmental Research Park where people can explore what the Fermilab Natural Areas have to offer. As the EPE office transitions to exciting new offerings, these legacy values will be honored. Space should also be carved out for new, virtual, programming, as it is able to reach a wider and more diverse audience. A virtual experience can never fully replace an in-person visit, yet virtual programming can engage those who may otherwise not interact with Fermilab's Education and Public Engagement.

As stated above, this plan has guiding ideas, specific actions and proposed methods to measure success. The specific actions range from ideas that can be implemented in a year to those that may take three years to fully realize, and Fermilab leadership will be briefed on progress twice a year. These are suggested actions and, as change is implemented, the specific actions and metrics may need to be reevaluated; however, pivoting will be done with the goal of best enacting the guiding ideas. The first section comprises overarching principles of the EPE office. These are the principles that all programs must adhere to. The second section describes guiding ideas relating to the intended audience. This document should be read as a comprehensive and cohesive description of what EPE intends to achieve over the next one, three and five years. A summary of actions and timelines is highlighted at the end. In particular, there are many overlapping areas between the section discussing serving students and teachers and the section discussing visits to the lab. Not every section will address every idea, but taken as a whole, this document clearly establishes the future of the Fermilab Office of Education and Public Engagement.

Overarching Principles of the Fermilab Education and Public Engagement Office

Alignment with current best practices in Formal Education, Informal Education, and Science Communications must be ensured. Continuous modernization of spaces and tools in all aspects of outreach and engagement to adapt to the ever-evolving national and global landscape is necessary. Fermilab EPE serves as a partner in learning with audiences, as a guide to science exploration and fostering creativity, and the catalyst for engaging in student-led experiences.

Specific Actions: The name of Fermilab’s Office of Education and Public Outreach should be changed to the Fermilab Office of Education and Public Engagement (EPE). The new name better reflects the goals of the office, which is not to *reach out to* but rather to *engage with* audiences we seek to serve. Internally, EPE will focus on professional development, such as journal clubs, conference attendance, and connections with the informal science education and science communication communities. The office will stay abreast of current research in science communication, informal science education, public engagement and formal education best practices. Recommended actions and interventions from current research will be applied to programming. Volunteer programmatic leadership and committees will rotate on a regular basis to allow for new views and perspectives. Focus will be placed on offering unscripted experiences, conversations and questions with no “right” answer.

Evaluation: The number of professional development programs participated in by staff, including the journal articles read, webinars attended, and conference attendance will be tracked. Evaluation of in-person programming should include information on the time visitors spent talking vs. the time their guides spent talking to ensure reasonable balance. Participation in new, unscripted areas will be tracked.

Everyone is capable of engaging with Fermilab science. To be truly inclusive we must actively seek out input from Black, Brown, LGBTQ, and other traditionally underrepresented communities, and evaluate programming based on its reach to underserved communities. We must also consider intersectionality of groups and ensure that voices from all communities are heard. All language used must be inclusive and culturally responsive, spaces must be accessible, and research and dialog must be done constantly to counteract the systematic erasure of scientists of color.

Specific Actions: EPE will increase its reach to underserved communities, in coordination with and building off of internal relationships with the Fermilab Office of Equity, Diversity, and Inclusion and the Lab Resource Groups and relationships with external groups such as the

National Society for Black Physicists, the Society for Hispanic Professional Engineers, and the DuPage chapter of the NAACP. EPE will establish an adequate way of tracking the continued participation in EPE activities via a robust database system that includes customer relations monitoring capabilities. This will include a volunteer database to ensure new volunteers and to engage with a diverse group across the lab and user base. We will prioritize continued staff training and development centered around equity, diversity and inclusion best practices. We will seek out educational partnerships with organizations including the American Indian Center of Chicago, local and national chapters of the NAACP, the National Society of Black Physicists, the Society of Hispanic Professional Engineers, the Society for the Advancement of Chicanos and Native Americans in Science, and the National Society of Hispanic Physicists. People from underrepresented groups should be actively engaged in Fermilab EPE programming development and evaluation. In program development, we will seek to include scientific contributions of scientists of color since this is often overlooked.

Evaluation Plan: Program participants will be tracked throughout their participation in EPE programs, thus providing data on who continues to engage and who does not. It will then be possible to find patterns in who is no longer participating. Demographics will be regularly queried to ensure reach beyond previously traditional groups. Ensure that those who no longer participate are contacted to better understand their hesitancy to participate. Evaluate all programs, both new and old, to demonstrate the impact on science identity for individuals from groups traditionally underrepresented in Fermilab EPE activities. Track what percentage of scientists represented in EPE programming are scientists of color.

Fermilab EPE seeks to translate the lab’s cutting-edge science to a broader audience. As such, EPE programs should align with Fermilab’s mission and core values.

Specific Actions: Establish Fermilab as a leader in the newly developing space of K–12 quantum science programming, building on the Fermilab-led Superconducting Quantum Materials and Systems (SQMS) center and other DOE-funded quantum research programs. A position specifically devoted to program development in the quantum space will be created. Evaluate all programs to ensure alignment with the mission of the lab. Develop exhibits and activities in the Lederman Science Center to specifically focus on quantum science. Update or remove exhibits that are no longer relevant. Continue Fermilab’s leadership in the merging of art and science.

Evaluation: Track partnerships and collaborations around quantum education. Evaluate proposed quantum educational programming to ensure alignment with equity, diversity, and inclusion

initiatives (see above). Evaluate programs to assess learning gains in Fermilab science. Evaluate programs to assess increased interest in science and science identity.

Serving Stakeholders:

Serving Teachers and Students:

A focus will be placed on conveying that the work at Fermilab is relatable to everyone. Every student who participates in EPE programming should leave knowing they have the skills to grow up to work at Fermilab.

Specific Action: Streamline registration and scheduling processes for all programs. Work with schools who have not participated in Fermilab EPE programs or have stopped participation to understand why and then eliminate barriers to participation. Based on this knowledge, reimagine the current field trip procedures, content and preparation required of teachers and students, with the goal of removing barriers and ensuring access for all.

Science identity is a crucial factor in continued participation in STEM. To build science identity in students served by the EPE office, it is crucial that the Fermilab staff and volunteers who students interact with look like them.

Specific Action: Create a “Student Advisory Committee” made up of students from neighboring school districts to ensure programs are relevant and engaging to them. Reimagine the Educational Facilitator (docents) program to make participation more broadly appealing and ensure a diverse group of facilitators. Create field trip offerings focusing on the different career pathways taken by Fermilab employees and users.

Fermilab’s EPE resources directed toward teachers must help teachers bring Fermilab science to their classrooms. Programs must align with state education standards (Next Generation Science Standards), be at the correct grade level, and be relevant to the student community.

Specific Action: Ensure that all activities and lessons developed for teacher workshops have a clear connection to Fermilab's mission, while also connecting meaningfully to state standards.

Evaluating success in serving teachers and students:

The number of students reached by these programs, as well as the duration of these interactions, will be tracked. The demographic information of the students and teachers interacting with the lab will be tracked to ensure traditionally underserved groups are being reached. Participants will be surveyed to ensure an increase in science identity, increased understanding of Fermilab and Fermilab science, increased comfort with science, and increased interest in STEM careers. The number of questions asked by students and teachers will be monitored to ensure two-way communication. If there is adequate funding, longitudinal studies will be performed to track the career paths of those who have participated in our programs.

Serving Employees and Users:

Fermilab staff participating in EPE should not be reserved for those on the science career path. Just as all employees and users support the mission of the lab, all employees and users should have the opportunity to participate in EPE activities.

Specific Action: A clear path for EPE involvement both for casual volunteers and those wishing to devote extensive time to EPE activities will be created. EPE will create volunteer opportunities specifically for mission-support employees, and will work to provide programming access to families across the Fermilab complex, including subcontractors. An EPE policy will be drafted to clarify the EPE office's role in lab-wide activities. A system for employees and users to pitch EPE ideas will be created. There will be dedicated listening sessions and workshops for employees and users to discuss their EPE interests and support needs with the office. Training will be created specifically for mission-support employees that would like to participate in EPE activities.

Contributions of employees and users to EPE, particularly from those early in their careers, must be recognized and celebrated.

Specific Action: We will work with lab leadership to explore the possibility of creating a task code for EPE activities. Create an award for employees and users with demonstrated excellence in EPE and annual recognition for all volunteers. Redesign the current "monthly report" to have a broader audience and highlight the contributions of employees and users to the lab-wide

community. Continue to provide opportunities for employees and users to interact directly with the public.

The EPE office should seek to leverage the wide range of skills, connections, and interests of all employees and users.

Specific Action: EPE will create an ongoing dialog with Lab Resource Groups and the Users Executive Committee. The lab community has a diverse set of skills and interests. Requests for volunteers must be clear and, when specific skill sets may be needed, must be asked for.

Evaluating success in serving employees and users:

The number of Fermilab community members participating in EPE activities will be tracked, as well as the divisions and sections that are most represented. Volunteers will be surveyed to ensure they are receiving adequate training and support. The number of programs proposed and implemented by employees and users, whether alone or as part of an LRG initiative, will be tracked.

Serving Visitors to the Fermilab Site:

Visitors must be provided with a comprehensive visitor experience that reflects the priorities of the lab, and best practices in public engagement and informal science education. The experience must be engaging, coherently branded, welcoming, and comfortable to all.

Specific Actions: Create “unscripted space,” such as a makerspace, and allow ways for visitors to leave their mark on Fermilab. Unify branding in public spaces (Wilson Hall, Lederman Science Center, LINAC, etc.). Increase signage to ensure visitors feel welcome and know how to interact with what’s around them. Include detailed directions on the “Visit Fermilab” page for accessing the lab via public transit and manage expectations around ID checks.

Public spaces need to reflect the diversity of Fermilab and of science more broadly. They must be welcoming and accessible to all. There should never be a prerequisite to visiting, whether as a student or as an adult.

Specific Actions: Create ways to honor the land that Fermilab occupies and the indigenous people who once lived there. Add places to sit down on the public tour path. Allow ticketing for events so that accessible seating can be reserved. The Arts and Lecture Series will further EDI goals by programming events with intentional inclusion. The Auditorium Committee structure and policies will be reviewed, and steps will be taken to ensure that new and diverse voices are being heard. Create all signs, both informative and directional, in both English and Spanish and include a QR code with links to translations in other languages. Incorporate sensory-specific programming and block off hours or field trips specifically for those with sensory sensitivities. Give tour guides microphones and offer headsets for those who might need one.

As the first people with whom visitors interact, EPE employees, volunteers, and others working with the public must be trained in inclusive language and best practices in science communication.

Specific Actions: Expand volunteer training to include training on equity, diversity and inclusion, inclusive language, avoiding the deficit model of science communication, and how to make space to allow visitors to speak. Commit to working only with volunteers who abide by the lessons learned in training.

Evaluating success in serving visitors to Fermilab's site:

The number of visitors will be tracked, including the number of repeat visitors. Visitor surveys will be conducted periodically to ensure the experience is engaging and informative. The number of people who further interact with the lab after their visit will be tracked. Reviews on sites, such as Google and Yelp, will be tracked and concerns responded to. As new programs such as a makerspace are implemented, these metrics may change.

Serving Virtual Visitors:

Fermilab's EPE website and social media should follow best practices in web design and public engagement with science and include a strong interactive component. Virtual interactions between the web and the visitor should be two-way.

Specific Action: The website will undergo an overhaul to incorporate dynamic content, interactive experiences, and visual appeal. Content will be updated and advertised on a regular schedule. A streamlined content management process will be determined to ensure timely updates with a clear workflow. There will be a clear method for feedback built into the website.

Our virtual presence, like all EPE at the lab, must be built on a foundation of equity, diversity, and inclusion, be accessible, and highlight contributions to science from a broad range of people.

Specific Actions: Content on the new EPE website should be solicited from across the lab, including content from those that do not have “scientist” in their job title. The language used should be person-first and inclusive. Both the website and social media should seek out content created by traditionally underrepresented groups. Content should be created in languages in addition to English. Features such as image description and closed captioning on videos should be implemented universally.

Virtual content is often the first impression that local, national, and international audiences have of Fermilab EPE. As the initial and oftentimes only conduit to such a broad audience, our virtual presence must fully convey the priorities of the lab in ways that are effective for many different audiences.

Specific Actions: The new website will have areas targeted to specific age-range visitors, including post-college and pre-K. It is important to highlight the human side of science, including, for example, profiles of Fermilab employees and users and their career paths. All content will be clearly tied to the mission of Fermilab.

Evaluating success in serving Virtual Visitors:

Website hits, time spent on the site, and the number of new and repeat visitors will be tracked and reported monthly. Social media engagement will be tracked and reported monthly. The number of websites linking to Fermilab EPE pages will be tracked. Periodically, visitor surveys will be conducted. Feedback received via the new system will be responded to promptly.

Resource Needs

A premise of this plan is that resources are limited, and for the most part EPE relies on its existing staff and the participation of Fermilab employee and user volunteers. EPE is exploring potential partnerships with external entities to further leverage its work and showcase Fermilab's science on an even broader scale.

Staffing: This plan calls out two specific staffing needs: a position focused on Quantum Education and a restructured Educational Facilitator program. Both can be achieved without increasing the EPE office headcount. By restructuring an open Educational Program Leader position, EPE has begun the process to fill a Quantum Education position. The Educational Facilitator (formerly docent) program has had several retirements. A pilot program focusing on a cohort model can be initiated without increasing the office headcount. We will work with groups in Aurora and West Chicago to create an Educational Facilitator position that best leverages the needs of the potential part time workforce in the area. The current program is attractive to a more narrow demographic and must be rethought. These staffing changes are built into the plan's timeline.

Budget: The largest near-term expenditures are adding a Maker Space to the Lederman Science Center and funds for a new EPE website and database. In the longer term, the LSC will need more expensive and substantial upgrades. Repurposing resources from the Teacher Resource Center (which is being dismantled) will be adequate to support the creation of a Maker Space. Funding for the upgraded website and database upgrades has been included in the office's budgets for FY20 and FY21. In the longer term, EPE has worked with FESS to ensure that the LSC modernization is included in the lab's broader infrastructure planning efforts. EPE will work with FESS to develop a budget and proposed path forward for a more substantial modernization of the LSC. In addition, as EPE further modernizes its programming, there are potential partnership opportunities with local institutions such as SciTech and Aurora University. Seeking grant funding with local partners is will be explored as part of EPE's growth and modernization efforts. Finally, the plan identifies the possibility of identifying a Task Code for efforts supporting EPE and EDI. The Chief EDI Officer is taking the lead in this area. If implemented, this Task Code would have budget implications.

Category	CY 2020	CY2021				CY2022				CY2023				CY2024				CY2025					
	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4	Q1	Q2	Q3	Q4		
Support Systems/ Administrative	EPE Policy																						
	EPE Name Change																						
	Website and Database restructure																						
	Hire Quantum Ed position Rework Monthly Report Format																						
Lederman Science Center																							
Programmatic and Visitor Experience																							
Broader Lab Community																							
Professional Development, Evaluation, and Reporting																							

 Completed
 In progress
 Upcoming
 Report to Leadership (Including Metrics)
 Restructure Programs Based on External Evaluation

Progress Made to Date

As can be seen from the timeline above, some of the action items in this plan have either been completed or are well underway. The name of the office has been changed from Education and Public Outreach to Education and Public Education. Additionally, each of the Lab Resource Groups now has a representative from the EPE office. A journal club has been meeting for the past three months to review current research in informal science learning with a focus on equity, diversity, and inclusion. The currently virtual Ask-a-Scientist program is recruiting speakers from across the lab (both science and mission support), as is the (currently virtual) classroom presentation program, and career-focused field trip. An ongoing connection with the Users Executive Committee was established as part of the strategic planning task force process and EPE will be a standing agenda item at UEC meetings.

The development of a completely refreshed Fermilab EPE website and new underlying database is underway, with an expected completion date of February 2021. The new database system will allow better tracking of participation and other metrics, communication, advertising and metrics across EPE programs, and demographic and other evaluation of program participation. A new website will present an interactive, modern, and engaging digital experience to those interested in Fermilab science. EPE's social media presence has increased since January 2020 with great success, with roughly 700,000 twitter impressions a month. The EPE Twitter feed features open-ended questions and videos to increase interaction. The EPE Facebook feed is looking to build on the success of Twitter and create an engaging platform.

With the present shift to virtual programming due to COVID, there have been many opportunities to reach out to audiences that the EPE office has not reached in the past. Most notably, the Saturday Morning Physics Program now reaches 200 students. This includes 27 students from Chicago Public Schools, which is a four-fold increase from previous years. While virtual programs lose some in person aspects, such as informal interactions among students and with instructors as well as on-site tours and demos, the addition of some virtual EPE programs have allowed students from around the country to participate in Fermilab science programs. The summer teacher workshops have been made virtual for the present time and modular. Several workshops are now being tailored to fit with the needs of West Chicago schools to ensure that their teachers are able to teach Fermilab science in their classrooms. There has been limited participation from West Chicago teachers in the past due to location and topic constraints; EPE is now working to address those issues and broaden the reach of its teacher training programs. A new Arts and Lecture at Home series as well as virtual Art Gallery Talks have brought Fermilab scientists into homes across the globe. When the lab reopens to the public for in-person programming, EPE is planning for some hybrid programming models to continue its broader virtual reach in addition to the benefits of hand-on in-person engagement.

In addition, EPE is engaged in planning to modernize the Lederman Science Center (LSC). An interactive visitors' guide and map is in development for touch tables located in both Wilson Hall and the LSC. This map will allow visitors to explore the site and learn about the science taking place all over the lab. The Teacher Resource Center at the LSC has been a valuable resource for many years, but with the wide availability of digital materials, it is not regularly used. Planning has begun to remove the current resources and repurpose the space as a makerspace to allow for student-led learning. EPE is also beginning to plan how to better position exhibits around the lab's public spaces.

Evaluation is a key piece of the new plan. Every EPE program now includes an evaluation plan that focuses on physics identity questions and alignment with Fermilab's mission, in addition to measuring learning gains. Demographic data is collected when possible with understanding that it will be expanded when the new database is functioning. As programs develop and grow, new evaluation techniques will be utilized.

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