



museums@home:

Connecting Informal and Formal STEM Educators
with
Families and Communities



STEMEAST
NETWORK

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Abstract

Classroom teachers are experts in providing learning opportunities for children of all ages; museums and science centers house valuable instructional resources and content experts; teachers and museums want to connect students and families to STEM experiences focused on exciting careers and livelihoods. In this paper we describe a regional effort to connect these STEM providers with their potential consumers in an effective and efficient way in a virtual collaborative environment. The museums@home program was developed to bring each of these groups together in a mutually beneficial manner to leverage the expertise of each group for the greatest impact. The development of museums@home has also spawned a number of integrated programs such as Inquiry Design Studio yielding unexpected results in raising awareness, promoting educational opportunities and building professional relationships focused on STEM.

Problem Statement

Schools have relied heavily in recent years on STEM-related events to bring parents into their child's classroom. Math nights, technology fairs and science expos have become ways to share student projects and products while providing an opportunity to explain a new and different approach to learning that is inherent in STEM education. It is well known among teachers that nothing gets parents into the building better than a “hotdog dinner and a student showcase”. When the 2020-21 pandemic struck, schools, unable to host these in-person gatherings, found themselves without this important method of communicating with parents at a time when communicating change was more important than ever.

A key informal STEM educator group, our regional museums and science centers, was likewise impacted by the pandemic having to close their doors and curtail services. This interrupted their major revenue stream and undermined one of the central missions of these institutions. They immediately began seeking ways to continue their outreach to schools and communities in hopes they would be able to reopen post-pandemic and still be useful and relevant.

Background

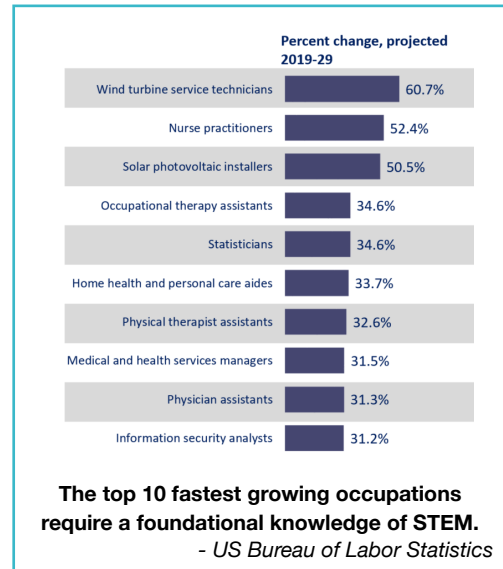
STEM Ecosystem

Serving as a regional member of the national STEM Ecosystem Community of Practice, STEM East Network exists to connect all STEM educators - formal and informal - in aligning instruction and focus messaging on college and career preparation. We work with schools, museums, science centers, libraries, out of school programming and regional business and industry. We serve as a convener of each of these groups to promote collaboration both within and across groups and share services. This often puts us in the position of “translator” as each group uses specific terminology determined by their organizational structure and goals. It is in this role that STEM East serves as arbiters of collaboration. We organize discussion and planning sessions amongst various partners and provide explanations and clarifications that assist with fruitful collaboration.

Formal STEM Educators

STEM education has become more than just a buzzword in eastern North Carolina. A working knowledge of each subject represented by the acronym - science, technology, engineering and mathematics - is recognized as the foundation for many of our existing and emerging career pathways. Healthcare services, advanced manufacturing and the alternative energy industry will seek our students as they enter the those growing STEM-focused careers. To prepare our students for entering this workforce it is important that they engage with STEM beginning in the early grades to develop an

understanding of STEM content. The Mathematical Practices of the Common Core State Standards (2010) as well as the Science and Engineering Practices from the Next Generation Science Standards (2013) also recognize the need for students to engage with content using the same methods as professional mathematicians, scientists and engineers. This requires a shift toward an inquiry-based instructional model with increased access to diverse instructional materials and content expertise. While our schools are managing the pedagogical shift they find themselves short of resources and content expertise. Limited by a traditional lack of funding for resources and, more importantly, professional learning opportunities, schools often lack the capacity to respond as quickly as they would like to the changing needs for preparing students to meet the demands of the developing workplace. To meet this need STEM East has worked with across 4 school districts in eastern North Carolina to develop an Inquiry Collaborative Network to provide professional learning opportunities for teachers in K-8 schools. The goal of this Network is to encourage a shift of school culture toward engaged inquiry in STEM classrooms.

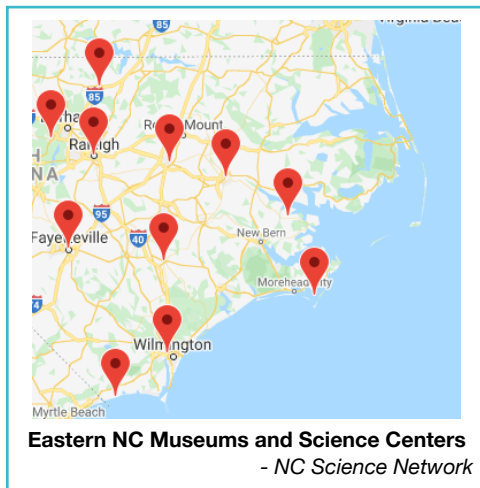


Classrooms today have taken on a look and feel very different from what many of us remember as the “traditional” classroom of our youth. Nowhere is this more evident than in STEM classrooms where instruction takes a more engaging inquiry-based approach. Students are asked to work in collaborative groups with shared sets of materials and resources that are used to ask questions and design solutions. They are often asked to present solutions supported by evidence with an understanding that there may be different and viable pathways to the answers that they present. Students are invited to engage with each other in robust discussions about direction and procedure that impact their response or design.

For parents this instructional shift has often been an adjustment as they still look for worksheets, textbooks and class notes as the basis of learning. Transitioning to an inquiry-based classroom has proven much more difficult for parents than for their students. Traditionally, schools have reached out to parents with letters and guidelines to help them understand and support this new mode of engaged learning at home. Often this has culminated in evening events such as a Math, Science or STEM Night where families are invited to learn more about inquiry engagement while experiencing the projects that students are doing in their STEM classrooms. Hearing and seeing their child explain how they might solve a complex environmental issue, program a small robotic device or design and prototype a solution to a community problem not only engages parents with a new vocabulary but also opens their eyes to the impact of classroom engagement and student inquiry.

Informal STEM Educators

Though informal tools and resources for STEM education are found in great abundance across our rural communities they are not always visible or easily accessible. Eastern North Carolina is fortunate to have a group of relatively small but very active museums and science centers. These museums have collections of resources and provide educational services that cover a variety of topics. Though our museums are open to



the public and available as a resource for schools to they are not always well known or accessible across such a large geographic region. Each museum is focused on education and many also house research facilities and special collections that are unique to the region. As is true for most non-profits, their survival is sometimes tenuous based on donations, grants and endowments. They exist to serve the public so every person that walks through their door not only helps

them to meet their mission of education, they are also a potential donor. Museums need patrons who appreciate their offerings and understand the need to share those with the public. Working with schools is a significant part of their daily commitment to education

but not necessarily a large part of their revenue stream. Field trips and guest speaker visits can hardly be expected to help museums and science centers meet their funding needs and keep doors open.

Solutions

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During our first few Inquiry Collaborative Network meetings of the pandemic schools expressed an urgent need to continue to connection with parents regarding STEM in classrooms. In response, we reached out to our regional museums to design a program to serve as a Family STEM Night for schools. Our intent was to support an evening webinar hosted by each of our schools that would showcase museum services and resources for teachers, students and their families. Thus was born the museums@home program. Each school was provided with customized promotional materials for distribution to families which designated their school as host of the event. Schools were given the option of starting their part of the evening event earlier than the museums@home webinar in order to talk with parents about school specific issues or programs. For example, one school had a short PTA meeting, another had a required Title I Parent meeting. After individual 30-minute school meetings, each school then connected their attendees to the scheduled museums@home webinar presenting themselves as cohost of the event.

museums@home: Aurora Fossil Museum

The first museums@home event featured the Aurora Fossil Museum in Aurora, NC in November 2020. This small museum sits beside the largest phosphate mine in the world and displays fossils found in the castoff matrix from the mine. Aurora Fossil Museum is resource rich with content expertise in many areas. The

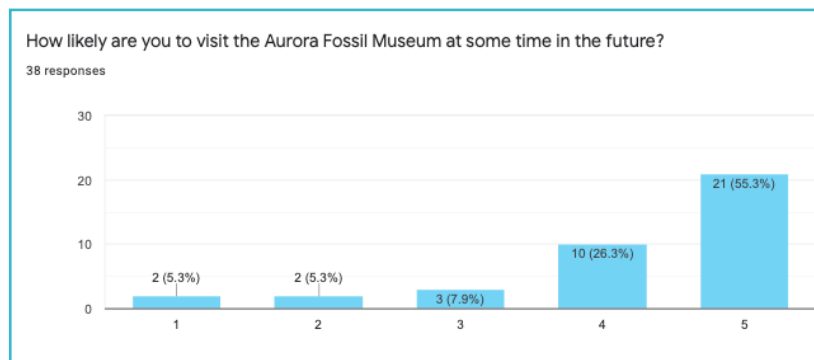
museums@home webinar was presented through a question and answer format focused on the major display areas of the museum; fossils, geology and indigenous



populations. The webinar was short but engaging, ending with an invitation for virtual attendees to visit the museum in person when conditions allowed. During this first event there were 147 individual connections to the webinar, each one representing multiple members of a teacher or student family participating in the event.

At the conclusion of the museums@home event, teachers, students and families were asked to complete a survey that also entered them into a drawing for a merchandise certificate from the museum. The results of the survey were illuminating and provided evidence to the museum that the webinar had created new relationships with the community. When asked if they were familiar with the Aurora Fossil Museum *before* this webinar more than 75% of respondents said they had little or no familiarity with the museum. Asked if they felt more familiar with the museum *after* the webinar, 100% of the respondents said familiar or very familiar. Most

important to the museum, 89% of the respondents said that they likely or very likely to visit the museum in the future. The survey also

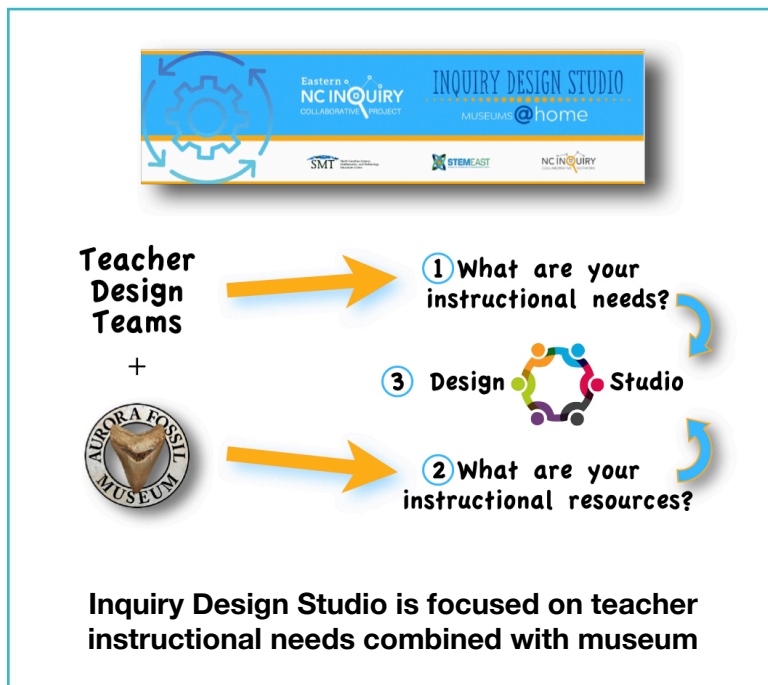


solicited ideas for how we could make the museums@home more exciting and relevant. Overwhelmingly they wanted to have an event with greater participation as many questions went unanswered. K-8 students can be demanding and impatient and we took this with us as we planned our next event.

Inquiry Design Studio: Aurora Fossil Museum

As part of STEM East’s support for teachers and inquiry-based instruction we planned for a series of virtual planning sessions between teachers and museum experts to design activities to take place leading up to the museums@home event. The purpose of the planning sessions was to engage students with an inquiry-based activity integrating museum resources or connecting with museum experts that would help build excitement for the museums@home Family STEM Night. We called this collaborative

process, comprised of 3 or 4 one hour sessions, our Inquiry Design Studio (IDS). The format of IDS was carefully crafted to take advantage of the strengths of each participant (teachers, school and district administrators, museum personnel) and to combat initial bias as to the value of the museum resources and services. We wanted teachers and district staff to enter IDS open to all of the resources that Aurora Fossil Museum had to offer and consider where they might be used to support instruction already planned for the weeks prior to the museums@home Family STEM Night. Our intent was to not disrupt planned instruction but to find ways to enhance the instruction with museum resources. Museums were asked to listen carefully to what teachers had already planned in *all* subject areas, not just STEM. They were then asked to tour teachers through all of the resources the museum had to offer. Museums were asked to refrain from referring to lesson plans or activities that the museum had previously prepared to use with schools and to suggest these later only if they integrated well with what teachers expressed a need for. After instructional needs of teachers and instructional resources of the museum had been shared, the formal design process was started.



During the design segment of IDS teachers and museum personnel were placed into virtual breakout rooms based on grade level span (K-2, 3-5, 6-8). Teachers referred to lists of instructional topics created by each grade level and agreed to focus on a single topic at one or more grade levels that might benefit from museum resources. Since teachers had listed needs in all subject areas they were

not limited to only STEM subjects. The lists also contained English Language Arts (ELA)

and Social Studies content. Not surprisingly, many groups chose to focus on ELA or mathematics since those are priority areas but some decided that this was the perfect opportunity to integrate with science and social studies. The final IDS session was spent with teachers and museum experts collaboratively designing the details of activities that included museum resources. These included fossil kits, photographs, charts and graphs provided by the museum often accompanied by virtual classroom appearances by museum personnel to co-teach a lesson or answer questions. Using STEMx grant funds we were able to pay for museum resources needed by teachers and compensate museum personnel for time spent planning with teachers and hosting the event.

[museums@home: Sylvan Heights Bird Park](#)

After the first [museums@home](#) event, partners of the Inquiry Collaborative Network met for one of our ongoing Café Meetings and the group expressed a desire to continue the museums@home events, including the Inquiry design Studio. We received reflective feedback that helped us refine both the museums@home event and the Inquiry Design Studio. Teachers were thankful for the opportunity to co-create activities and build new relationships across school districts and with museums. Suggestions were made to personalize the museums@home format that would further personalize the event. Teachers suggested they be included as facilitators. It was also suggested that student questions be gathered prior to the event and become the basis for our Q&A. With attribution given to the student that submitted the question, the connection between schools, students, families and museums would be made more explicit. Most importantly, students would see their own interests and curiosity as an integral part of the process.

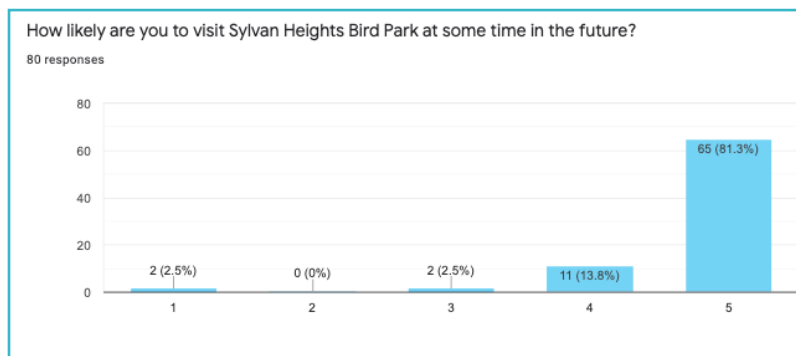
Our second [museums@home](#) took place in the early spring of 2021 and featured Sylvan Heights Bird Park as our Family STEM Night museum. Sylvan Heights is located in a small rural community in eastern North Carolina and is home to the world's largest collection of waterfowl. The plan for the virtual event was



focused on sharing these resources through pictures, videos and live demonstrations. Moderators asked student-submitted questions which allowed us to partner with museum staff to answer questions most commonly asked by students. The most outstanding part of the webinar was when the museum director fielded questions live from the chat box, calling students by name and providing candid answers.

Once again the response from our attendees was overwhelming. With over 300 concurrent virtual connections serving many families and community members we had surpassed attendance from our first museums@home. Post-webinar surveys found that

more than 60% of attendees were somewhat or very familiar with Sylvan Heights before the webinar; that rose to 100% after the webinar. Of all survey respondents, more than 96% said they were likely



or very likely to visit the museum in the future. Increasingly we were seeing a positive response from the community as museums were highlighted through museums@home, school messaging and engaging classroom activities designed during the Inquiry Design Studio.

Inquiry Design Studio: Sylvan Heights Bird Park

As had been established during our first museums@home planning process, teacher and museums partners collaborated for our second Inquiry Design Studio. About four weeks prior to the museums@home event teachers and museum staff came together to share instructional needs and instructional resources . Though we followed the same format as before we found that teachers were more confident in leading conversations around instructional needs. Museum personnel were open to hearing teacher needs and responded with resources they might provide to accentuate lessons in STEM subjects as well as ELA and Social Studies. A pattern was setting in of trust and collaboration between participants of the IDS and there emerged a comfortable

creativity in their design work. Teachers requested resources that would be helpful during these activities such bird feeders, identification pamphlets and webcams. They were planning for students to “become the scientist” and learn to observe, compare and write about birds at their schools. Many adopted bird identification apps for their mobile devices to record their observations as citizen scientists. There was broad engagement among students that followed them home and involved siblings and parents, creating an excitement for the coming museums@home family STEM Night. Teachers gathered questions from students that were used to frame the Q&A of the evening event. STEM East and the Inquiry Collaborative Network saw engagement at all levels (students, parents, funders, community) and with all partners (district staff, schools, museums) which was reflected in the number of attendees for this museums@home event.

museums@home: Next Steps

Lessons learned with assistance from the 2020 STEMx Challenge Grant we will be used to continue our partnership with regional museums to host more museums@home Family STEM Nights for our regional schools. We are currently starting our third Inquiry Design Studio in preparation for another museums@home event later in the spring of 2021. We find that each iteration of our work yields a refined process that is increasingly led by teachers who are finding willing partners in their budding relationships with our regional museums. We will support the growth of these relationships as it is clearly beneficial in connecting the formal and informal STEM educators in our STEM Ecosystem.

As a work in progress we are paying close attention to feedback from our collaborative partners across our regional STEM Ecosystem. While we strive to meet the needs of schools, museums and families through these two programs we are looking outward to other groups that make up our regional Ecosystem. A key question from our survey to museums@home attendees asked for suggestions for other events they would like to see in the spirit of museums@home. It was suggested we look at hosting events with regional employers who could explain more about what happens at their facility and what they are looking for in future employees. We shared this suggestion with teachers

and they were excited about working with scientists, engineers and other employees from business and industry in an Inquiry Design Studio setting. We also received requests to partner with other Ecosystem educators such as libraries and after school programs. Their need for resources and professional learning opportunities is great and Inquiry Design Studio may help facilitate conversations and build relationships with others who share the same interest in STEM education.

Conclusion

museums@home has introduced a new method for promoting collaboration between members of the STEM Ecosystem of eastern North Carolina. As we entered the year of the pandemic STEM East and the Inquiry Collaborative Network reached out to provide answers to extraordinary circumstances facing our schools and museums. Creating a platform for conversation and collaboration strengthened their instructional resolve and developed lasting relationships. Perhaps in months to come we will see libraries@home, business@home and medicine@home, each accompanied by an Inquiry Design Studio, that promotes STEM education and inquiry-based instruction across all communities in eastern North Carolina. Together we can then meet the challenge of raising awareness and interest among our students to pursue careers defined by the creative, thinking workforce that is STEM.

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