

TexNET

Summative Evaluation Report on a Statewide
Museum Network

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TexNET

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I. INTRODUCTION

In 2005, the National Science Foundation provided funding to create the Texas Network for Exhibit-Based Learning and Teaching (TexNET), a network of museums in Texas which was modeled on the Exploratorium Network for Exhibit-Based Teaching (ExNET). Led by a partnership between the Fort Worth Museum of History and Science and the Exploratorium, the project over two phases of work created a network of museums across Texas designed to build the collective and individual capacity of the museum staff and to provide visitors to these museums with rich interactive experiences.

History and Evolution of the Project

The initial project design was for the Fort Worth Museum of History and Science to serve as a hub or node for this new network of three smaller museums throughout Texas who serve rural and underserved audiences – Discovery Science Place in Tyler; the Imaginarium of South Texas, Laredo (formerly the Laredo Children’s Museum); and Science Spectrum in Lubbock. The work of TexNET in phase one involved rotating three sets of Exploratorium exhibits through the three smaller museums, coupled with professional development opportunities. Fort Worth – as the local hub – orchestrated the program of professional supports that the project provided to the museums. The Exploratorium provided exhibits and, along with Fort Worth, supported a range of professional development opportunities. Exhibit sets covered the topics of motion, sound and weather, and the sets stayed at each museum for one year. The professional development opportunities ranged from site-specific workshops tailored to the needs of the individual sites, as well as network-wide sessions and meetings, and involvement in broader statewide and national informal science education meetings (such as the Informal Science Education Association of Texas, Texas Association of Museums, and the annual Association of Science-Technology Centers conference).

Through exhibits, public programming, and professional development, it was theorized that this project would lead to greater access to high-quality learning experiences for visitors, staff, and others interacting with partner museums. TexNET would increase the capacity of the smaller partner museums by contributing the imprimatur, connections, resources and experience of the Exploratorium and Fort Worth. It would increase the capacity of partner staff to provide high-quality learning experiences within their own communities, and create mechanisms for partner museums to interact

with each other, sharing expertise, in a sustained fashion. Thus, the partner museums, along with others in the field interacting with the TexNET network, would build and then share expertise in terms of:

- providing informal inquiry-based experiences for the general public, teachers, and other museum visitors;
- marketing new exhibits, programs and other museum resources;
- increasing the visibility of the museums in their communities;
- serving people traditionally underserved by museums; and
- networking with others in the region and in the broader museum field.

At the end of year three of the project, project leadership, along with the evaluation team and network members, took stock of the first three years of work. While progress had been made in achieving many of the project's initial goals, there was general consensus that more could be done to build both the local capacity at individual museum sites, and to strengthen the network.¹ Many of the original museums had participated in Playful Invention and Exploration (PIE) workshops at the Exploratorium and Fort Worth as part of the activities of TexNET; network members were interested both in deepening their own experiences with tinkering, and in building their capacity to provide these experiences for their visitors. Thus, in phase two of the project, which began in the late spring and summer of 2008, the focus of activity for the network shifted to developing staff capacity and visitor experiences around tinkering. Because there were other museums in Texas who had experience with tinkering and also wanted to learn more, three additional museums were invited to join the network: The Children's Museum of Houston; Don Harrington Discovery Center in Amarillo; and Austin Children's Museum. Phase two work involved tinkering-specific professional development, additional network meetings, site visits to network museums, and small grants to each museum to fund the development of tinkering spaces, materials, and/or professional development at local sites.

The Evaluation

Inverness Research was hired to conduct the external evaluation of the project. Over the course of the project, we have served as critical friends, formative evaluators, project documenters, and summative evaluators. Evaluation activities over the life of the project have included:

- participation in project meetings
- observations of and participation in professional development activities
- site visits to all member institutions throughout the project

¹ For more details on phase one of the project, see Appendix A, which includes a memo summarizing our findings from the first three years of the TexNET project.

- ongoing conversations with project leaders
- ongoing interviews with partner museums
- ongoing formal and informal feedback from interviews and site visits
- preparation of annual reports
- preparation of this final report

This Report

This summative report draws on all of the data collected throughout the five-year project, although we will be focusing largely on phase two of the project – the work of the past seventeen months. For more details on the outcomes of the first three years of TexNET, please see the summary report for phase one in the attached appendix.

The rest of this report is organized into the following major sections:

- The Contributions of the TexNET Project
- Lessons Learned About the Design and Implementation of TexNET
- TexNET as a Model of a Statewide Network
- Summary and Reflections

II. THE CONTRIBUTIONS OF THE TexNET PROJECT

Over the course of the past five years, TexNET has contributed to the informal science education (ISE) professionals involved in the network, building staff capacity at member institutions. The project also contributed to network institutions. The network that was created has established and fortified relationships and connections among institutions that will be a lasting legacy of the project. And the participating ISE professionals have shared their experience with others in the broader ISE field.

Building staff capacity

The TexNET project was built around the idea of sharing exhibits and resources, but the heart and soul of the project, particularly in phase two, was professional development. The project sought to increase the capacity of staff at member institutions to provide high-quality experiences for their visitors.

The project provided a significant amount of professional development for staff. Since August 2008, the project engaged TexNET member staff in roughly 225 days of professional development. This included tinkering professional development workshops that involved the entire network, as well as workshops at individual museums or ExNET partner sites. TexNET members were invited to participate in inquiry institutes at both Fort Worth and the Exploratorium, and workshops on

facilitating floor staff at the Exploratorium. The majority of this work in this phase was shepherded and facilitated by Sam Dean at the Exploratorium. Additionally, beyond the 225 days, staff from museums visited other network member museums, sharing everything from the kinds of tinkering experiences they offer, to more nuts and bolts ideas about general museum operations. In sum, network leaders and partner museum staff spent a significant amount of time together in professional development workshops, and visiting each other's institutions.

Both staff who have actively participated in the professional development the project has offered, as well as additional staff at member museums, have benefited from the trainings and workshops. Those participating most actively in TexNET credit the project with providing them with access to high-quality professional development, and a network of people to share ideas and lessons learned with. As one director noted:

TexNET has been an amazing opportunity for us to professionalize, to grow in our professional capacity.

Perhaps most importantly, individual staff members have an extended group of museum professionals throughout the state to interact with and learn from on a regular basis. These connections are vital for overcoming the isolation of working with small staffs in small museums in a large state. These relationships and connections will also continue long after the grant funding ends.

It has been so nice through TexNET to share ideas, momentum, best practices... it is so nice not to have to re-invent the wheel all the time.

The examples below demonstrate the range and types of connections fostered through the TexNET project – among partner museums, between partner museums and the lead institutions, and between TexNET members and outside experts and resources:

- Lucinda Presley from Tyler, in conjunction with Exploratorium staff, created an innovative art-science teacher professional development program. She and Modesto Tamez from the Exploratorium spent several days in Laredo providing training to teachers and museum staff from Laredo.
- Christina Soontornvat from Austin led a conference call of interested TexNET members wherein she shared the lessons they had learned from the creation of their temporary exhibit Maker Kids.
- Staff from Houston hosted visits from several other TexNET partner museums, including Tyler and Laredo, to tour their new tinkering space, Invention Convention. Houston staff allowed museum staff from Laredo to shadow them throughout an entire day, providing an invaluable “on-the-floor” experience for

Laredo's young staff. The exhibits Laredo created for their tinkering space were modeled heavily on Houston's exhibits.

- Staff from Laredo created a set of marketing materials to share with other TexNET museums for the visual perception exhibits.
- Amarillo invited TexNET museums to participate in an early childhood professional development workshop, and also hosted several TexNET museums for a Scratch workshop and at their Mindfest event.
- Sam Dean from the Exploratorium invited Erik Smith from the Reuben Fleet museum in San Diego to join the TexNET tinkering summit in January of 2009. Reuben Fleet, an ExNET partner, was hosting the Tinkering exhibit set that the Exploratorium had developed, and Smith graciously shared his experiences providing tinkering opportunities to visitors, and building staff capacity at his institution. The sharing was mutually beneficial to TexNET members and Smith.
- Almost all of the TexNET museums have hosted Mindfests, large-scale tinkering events. Numerous TexNET member museum staff have traveled to, helped staff, and learned from each other's Mindfests.

Institutional Benefits

Partner museums in TexNET benefited in multiple ways from their participation in the network. In the early years of the project, the exhibit sets from the Exploratorium allowed museums to provide new, high-quality experiences to their visitors. The fact that the exhibit sets were at each museum for a full year also provided time for educators to develop solid core programming around the exhibits, and time for museum staff to learn from observing and interacting with their visitors around these exhibits. Being part of the network also added credibility to smaller museums, who leveraged their relationships with both the Exploratorium and Fort Worth in their local areas to get buy-in and funding for projects. As Sandy Henry from Lubbock noted:

It has been great for us PR-wise being part of this larger group. We have used it in other proposals. Showing that it isn't just us, that we are part of something bigger, brings prestige.

In the last 18 months, the project provided funding for each of the partner museums to create new, or enhance existing, tinkering exhibit spaces at their museums. Museum staff created flexible exhibits and programming spaces in their museums that allowed visitors to engage in tinkering experiences.

In a few cases, the funding also allowed for professional development for a wide range of museum staff. The professional development was high-quality, involving some of the foremost professionals in the informal science education field. Most museums also tried to ensure that the majority of their staffs participated in high-quality professional learning experiences, by using tinkering funds to bring experts to their museums to do full-staff trainings, and by taking many staff members to visit other TexNET museums.

We provide examples of the institutional benefits each of the TexNET member museums have gained from their participation in the project:

The Imaginarium of South Texas is a completely different institution since the TexNET project began. It moved from being a tiny children's museum on a college campus to being a hands-on, more science-focused institution located at the large Mall Del Norte. The exhibit sets and professional development provided by TexNET laid the foundation in the community for the new vision for the museum. Furthermore, the work with tinkering helped museum staff to create a set of tinkering-based activities that they are using in outreach activities with high-needs communities in rural areas outside of Laredo, on the Mexican border (this activity was supported by additional funding through Dragonfly TV and the program SciGirls En Familia). As the director, Melissa Cigarroa, noted:

TexNET has been such an amazing thing for us. It has helped us develop into an organization that has relevance for our community.

Discovery Science Place, through innovative arts and science professional development workshops for teachers developed around the TexNET exhibit sets, was able to solidify a relationship with the local school district that had been limited prior to the project. The project also enabled them to create a new exhibit space, which originally housed the three exhibit sets, but now houses the tinkering studio.

Science Spectrum in Lubbock used tinkering funds to renovate an existing diner space, converting it to a tinkering café. They now regularly provide changing tinkering programs to their visitors. Ken Finn from the Exploratorium also came and did intensive professional development for all of Lubbock's floor staff, something that was very valuable. James Naismith said:

It was good to have someone from the outside come in. Watching him work with visitors was really valuable and created some real light bulb moments for our staff.

The Children's Museum of Houston contracted with the Science Museum of Minnesota to offer tinkering professional development to most of their staff to coincide with the opening of their Invention Convention space. TexNET was able to provide a level of

professional development across the staff at the Children's Museum that had been difficult to afford. As Cheryl McCallum noted:

We need broad staff development and not just a couple of people going to a high-level workshop.

Austin Children's Museum created a temporary exhibit called Maker Kids as a prototype for a tinkering space being developed for their new museum. They benefited from TexNET in that it provided a vehicle for honing leadership skills, sharing lessons learned from the project, and hosting the tinkering summit in early 2009.

At the Don Harrington Discovery Center in Amarillo, TexNET supported a three-pronged investment in tinkering the museum felt it needed in order to offer high-quality tinkering experiences for visitors. Project funding enabled the museum to purchase PICO cricket kits to use in tinkering experiences, and provided opportunities for professional development for staff that coincided with three tinkering-themed exhibit sets the museum hosted. As Chip Lindsey noted:

We have been co-developing staff, stuff and materials and moving ahead on all those fronts in this past year. There have been some neat moments for tinkering and we've been able to work on developing a culture of tinkering, so you have an unspoken way of thinking about what can happen in these spaces.

For Fort Worth, one of the lead institutions, TexNET has represented an opportunity to re-build some of the staff capacity for providing tinkering experiences the museum had lost over the past years due to staff turnover. Staff capacity that had been developed at the Fort Worth museum over the past ten years, through their participation in the PIE grants, and through several ITEST grants, has diminished. However, TexNET helped tide the museum over, by providing access to expertise and resources through the network. Sam Dean from the Exploratorium described TexNET being like a portable hard drive – distributed institutional capacity spread throughout the network, that acts as a buffer when there is staff turnover. As Charlie Walter noted:

Through the TexNET network, we have actually gained institutional capacity. I have thought of staff capacity as being within the four walls of our museum, but the integrity of the network overlapped the institutional integrity and helped us.

Visitors to these institutions have benefited as well. In all locations, TexNET has helped to provide new, innovative, inquiry-based experiences. In some cases, these experiences are directly benefiting the highest-needs populations. The vignette that follows highlights a tinkering activity the Imaginarium of South Texas provided at a community center in El Cenizo, a border town just outside of Laredo:

In El Cenizo, a small, rural outpost on the US/Mexico border, very few opportunities exist for youth to engage with science. In the small community center, twenty youth, ages toddler through middle school, along with seven moms, gathered. Melissa and four staff from the Imaginarium distributed blocks for the little ones to play with, and construction paper, markers and tapes to the older youth. Staff helped the youth construct rockets, then take them outside to test on a PVC pipe contraption—a stomp rocket launcher. The kids excitedly spent the next hour testing their rockets, running back inside to make modifications or build another one, then testing again. Staff questioned the kids about their rocket designs and why they thought some went higher while others went farther. Throughout the two-hour activity, the youth were very focused and the air was filled with laughter. The interactions and relationships between the children and the staff were warm and engaging. At the end of the day, several youth lingered to talk with the staff; two children even tried to hop in the car with staff to go home with them.

Broader Benefits to the ISE Field

The staff and institutional capacity fostered throughout the TexNET museums has provided benefits to the broader ISE field within Texas as well. Three TexNET member staff have served on the board of the Informal Science Education Association of Texas in the past several years. In the winter 2009 publication of the association, Chip Lindsey from Amarillo, Melissa Cigarroa from Laredo, and Charlie Walter from Fort Worth all had articles highlighting their thinking and the work of their museums.

III. LESSONS LEARNED ABOUT THE DESIGN AND IMPLEMENTATION OF TexNET

This section of the report highlights some of the lessons learned from this project. In this section of the report, we summarize the lessons learned from the design and implementation of the TexNET project. In particular, we discuss the state as the boundary or context for the project, the critical mass of members needed for optimization of the project, the shared leadership of the project, and the focal theme for the work in phase two.

State as the boundary/context

This project theorized that a statewide network would work well in developing and supporting the capacity of museums. In this case, the state was a logical boundary for the network. Network members share knowledge of the state's context—the education standards, funders and partner organizations. As a staff member from Houston noted:

Texas is unique. We all have to help address state standards to get schools to come. There are real advantages to a statewide network. We are close enough we can get to each other's museums and we understand each other. We share similar challenges with fundraising.

Some TexNET members partnered with other statewide efforts, providing professional development to the state's teachers with the Texas Regional Collaboratives. Network members also capitalized on other statewide gatherings, arranging TexNET meetings during other statewide museum association meetings, such as at the Informal Science Education Association (ISEA) and Texas Association of Museums (TAM) meetings.

And while the state made a logical boundary for this project, near the end of the project when network from two nearby states with high rural populations began to participate in professional development efforts, a real synergy emerged. As we'll discuss in the final section of this report, we think this is an area for fruitful future collaboration.

Critical mass

Another key lesson learned from this project is that it takes a critical mass of museum partners for an optimal network. The original project involved three partner museums, of different sizes and at different stages as museums. While the initial partners clearly learned from one another, the original network was simply too small. Adding three additional partner museums strengthened the project in many ways. The new partner museums brought additional expertise to the network. In addition, smaller sub-groups of the network could work together and share what they were doing with the larger group, something that didn't happen when the network was comprised of fewer museums.

Two lead institutions

The project, in effect, had two lead institutions—Fort Worth, who acted as a local hub and facilitator, and the Exploratorium, who provided the exhibits and access to additional professional development. Having two leads had advantages and disadvantages. On the positive side, both institutions at times provided similar professional development experiences, such as inquiry and PIE institutes, which provided multiple opportunities for TexNET members to participate in high-quality professional development offerings. On the negative side, it was often confusing to the

participating museums who was in charge, and who to go to when they needed help. For example, while the Exploratorium built the exhibits in phase one, partner museums were to go to Fort Worth with any problems with the exhibits. This did not turn out to be the best arrangement, and most of the time, museum staff went directly to the Exploratorium for assistance. In general, for networks to be successful, strong central leadership, vision and championing of the network, is needed, along with distributed responsibility and the ability to make things happen spread throughout the network.

Focal theme

For phase two of the project, the TexNET members decided to focus on increasing their capacity to provide high-quality tinkering experiences for their visitors. The focus on tinkering for phase two was beneficial for a number of reasons.

First, it built on the interests of many partner museums who had participated in the PIE workshops at the Exploratorium and Fort Worth; network members were interested in continuing their professional development in this area. Secondly, the needs of the individual institutions involved in the project varied greatly; some were interested in developing more outreach activities, others wanted exhibits, while others wanted activities that would fit well into special events. Tinkering provided a focal point with enough flexibility that partner museums could tailor the professional development they received in this area to fit a number of situations and needs at their institutions. As Cheryl McCallum from Houston noted:

The good thing about this collaborative is that it had more of a “just-in-time” quality. Instead of it being a pre-prescribed, huge initiative, we were able to do what we needed to do here. We had multiple opportunities to go to all these great places. And the grants allowed people to create exhibits more on a grass roots level.

Third, shifting to a focus on tinkering allowed for a good entry point for additional network members to join. The three additional museums had expertise in providing these kinds of experiences to visitors, but they were also interested in learning more and, more importantly, in working more with other museums. The focus on tinkering also created a level playing field with the entry of these new museums. Everyone was working and learning together, and the nature of these activities and professional development experiences are such that no matter if one is an expert or novice with tinkering, everyone can start from where they are and build from there. Thus, some network members were just beginning to provide tinkering experiences as a result of TexNET, while others were enhancing their ability and developing additional expertise in working with other museums to provide these high-quality opportunities to their visitors.

Perhaps most importantly, focusing on tinkering connected TexNET to many others throughout the country doing this cutting-edge work. TexNET felt like it was part of something bigger, a movement in the informal science education community that involved many other museums.

However, as museum staff discovered through the exhibits and activities they developed through the project, offering high-quality tinkering experiences is not without its challenges. Developing a culture that supports inquiry through tinkering was an uphill battle for some. Because the network began this line of work late in the project, opportunities to tackle some of the challenges inherent in offering these types of experiences were limited.

IV. TexNET AS A MODEL OF A NETWORK

In this section of the report, we focus on TexNET as a model of a network. Drawing on our past work evaluating networks, as well as the work of others who have studied networks,² we discuss the functions and characteristics of a healthy network, then examine TexNET within that framework. In addition, we look at the local contextual features at individual sites that impact the extent to which an outside network can make contributions to those sites.

Functions of a Network

From our previous studies of networks, we have identified the following key functions of a network: site-to-site, site-to-network and network-to-site, and network-to-external world. Site-to-site functions involve the network facilitating sharing among the member sites. Site-to-network and network-to-site functions involve network leadership collecting ideas from individual sites and sharing that data back out to the whole network. And network-to-external functions include the network serving as a hub or node that both connects members to and draws from the external world. A successful or healthy network allows for all three of these functions to occur.

² For more information on Inverness Research's evaluations of networks, see the NISE Network Evaluation series of reports (May 2009); Investing in the Improvement of Education: Lessons to be Learned from the National Writing Project (December 2008); Texas Network for Exhibit-Based Learning and Teaching: Getting Better at Getting Better (February 2008); all can be found at the Inverness Research website at <http://www.inverness-research.org>. For more on professional development networks, see Ann Lieberman and Diane Wood's *Inside the National Writing Project: Connecting Network Learning and Classroom Teaching* (2002, Teachers College Press). See also Bruce Hoppe and Claire Reinelt's *Social Network Analysis and the Evaluation of Leadership Networks*, January 2009, and Keith Provan and H. Brinton Milward's *Do Networks Really Work? A Framework for Evaluating Public-Sector Organizational Networks*, Public Administration Review, July/August 2001.

In terms of site-to-site functions, TexNET was successful in facilitating individual member sites sharing knowledge and ideas with one another. TexNET funding enabled staff from member museums to visit each other's sites. And TexNET meetings routinely involved museum staff sharing programming and exhibit ideas. In the contributions section of this report, we outlined several examples of the kinds of site-to-site sharing that the project involved.

In terms of network-to-site and site-to-network functions, both Fort Worth and the Exploratorium were good hubs. They helped provide opportunities for individual site members to participate in high-quality professional development opportunities, such as inquiry, PIE and Explainer institutes at the Exploratorium and Fort Worth. They were adept at connecting individual TexNET museums with resources and expertise, and at facilitating the sharing of what individual museums learned through those opportunities with others in the network.

In terms of network-to-external world functions, the TexNET network connected with several other initiatives – including PIE, other statewide networks and collaboratives, (for example, the Oklahoma Museum Network and Arkansas Discovery Network), and other museums doing innovative tinkering work, such as the Science Museum of Minnesota. The Exploratorium often incorporated TexNET museums into ExNET partner professional development offerings, as we discussed in a previous section of this report. TexNET was an attractive partner for these other entities to work with: by partnering with the network instead of a single institution, they could expand the reach of their offerings, knowing that the representatives from TexNET who participated in their work would share what they learned with others in TexNET.

However, there were a few examples of where more could have been done to strengthen these three network functions in TexNET. In particular, because the tinkering experiences happened late in the project, more opportunities were needed to share experiences and learn from one another about how to successfully implement high-quality tinkering experiences. In addition, there were missed opportunities in the last year for the whole network to learn from the work that was happening at individual sites. When professional development opportunities were happening at individual sites, sometimes other TexNET sites did not know about them. More facilitation was needed to capitalize on a network-wide basis on what was happening at individual sites.

Another complicating factor in this network was what we characterize as a “parent/child dynamic” that was established in the early years of the project. The Exploratorium and Fort Worth were very generous in sharing exhibits and ideas, and required very little of the original partner museums in return. This fostered a bit of a “what will you give me next” mentality among the original partner sites who sometimes took more than they contributed to the network. The shift in focus to

tinkering, where partner sites were expected to create their own tinkering activities and share what they learned through that process, helped alleviate this. As one museum director said:

We don't always want to be the one coming with our hands out. It's nice to be able to come to a meeting and share what we have done, to give as well as to receive. With the focus on tinkering, we saw the greatest opportunity for our team to grow.

Also, as the original partner sites matured and developed, their needs changed and lessened to some extent. Finally, additional mechanisms to help foster individual sites' contributing to the network would have been helpful. There was a ning site created to foster sharing among the members between face-to-face meetings, but this resource was not widely utilized by member staff. There would be a flurry of contributions around meetings, but then participation would drop off. Perhaps additional seeding or facilitation of the ning site would have helped.

Characteristics of a Healthy Network

In our evaluations of other networks, several characteristics of successful, healthy networks have emerged. A network works well together when its members:

- have a shared sense of purpose
- have a collective and shared identity
- do work together
- have knowledge of each other
- develop leadership in a collective and distributed fashion
- assume shared responsibility for the mission of the network
- contribute to and use the collective knowledge of the network

When we examine TexNET in light of these characteristics, we see a network that was more successful along some of these dimensions than others. In terms of a shared purpose, the shift to tinkering helped strengthen the network. Simply having Exploratorium exhibit sets and being from Texas wasn't quite enough to form a strong, shared bond. In addition, this kind of identity and relationship-building takes time, new partners were added near the end of the project, and the stronger, shared sense of purpose also did not emerge until the end.

TexNET members did do work together and have knowledge of each other, although participating museums always wanted more opportunities to visit each other's institutions. In terms of distributed leadership, toward the end of the project, the group was moving slightly toward leadership that was more collective and distributed. As we mentioned before, the dynamic of "gifting" at first made that difficult in the early years

of the project. Some museums assumed shared responsibility for the network more than others. The threshold for participation was low – there was little incentive for museums to take on more shared responsibility. And over the course of the project, members were contributing to the collective knowledge of the network.

Local Contextual Factors

In our evaluation of TexNET, we found that local contextual factors at partner museums can play a key role in the extent to which a network impacts partner museums. Working with small museums requires attention to key issues outside of the focal ones of the network, including operations, governance, finance, staff turnover, etc. In some cases, despite sometimes turbulent and difficult local situations, TexNET had a fairly significant impact because network leaders helped partner museums address some of these issues. In these cases, TexNET provided outside guidance, perspective, vision and continuity where the internal context was less stable. In other cases, TexNET seemed to have less institutional impact. While the network can't control much of this, we think it is important to highlight some of these contextual factors so that, in future efforts, these might be taken into consideration.

With TexNET, the key local factors influencing the impact of the network included the following big dimensions: vision, initiative and interest, attention to museum-wide staff development, and staff turnover.

Vision: The degree to which there is congruence between the network's vision, the institutional vision, and the vision of key staff members from participating museums in the network was one determining factor of TexNET's impact on museums. In some cases, individual staff people's vision were in line with the vision of the network, but the institution was heading in a different direction.

Initiative and interest: Some museums were more interested in and willing to try new things, and to learn from other museums, than others in the network. Some also felt greater responsibility from the very start not only to draw from the network, but to contribute to it.

Attention to museum-wide staff development: A key local contextual factor was the willingness of museums to invest in broad, museum-wide staff development. Many of the participating museums viewed TexNET as an opportunity to expand professional development offerings to more of their staff. These museums consistently engaged staff throughout their museums in TexNET meetings and workshops. Others tended to engage more than core staff only when TexNET offerings happened at their institution. We think those that invested more in terms of strategically spreading participation in TexNET throughout their staff probably gained more from their participation in the network.

Staff turnover: Staff turnover at individual institutions is almost always a factor in network or collaborative projects. In this case, the staff turnover was both a positive and negative influence on the project, and on the influence of the network at individual museums. For all five of the original partners, including the two lead institutions, there was turnover in the staff that participated in the project. In some cases, the turnover among the partner museums strengthened both the individual museums and their participation in the network. In other cases, staff turnover, and the worry that staff would leave, limited the willingness of some museums to have more staff participate in TexNET activities. This creates a catch-22 of sorts, where museum staff don't feel invested in, and thus, leave, and museum leaders feel less willing to invest professional development time and energy in more staff.

V. SUMMARY AND REFLECTIONS

The model that emerged in the last phase of the TexNET project was very promising, and is one that has the potential to be valuable to other statewide networks. In summary, the model consisted of:

- Providing relatively small amounts of funding to each site to create customized tinkering activities, purchase materials, and provide professional development
- Providing group-wide high-quality professional development focused on tinkering which created shared experiences, vocabulary, and a shared culture of tinkering

This distributed research and development model resulted in a portfolio of work among the partner institutions that resulted in innovations and improvement in quality experiences for visitors. What was needed to fully capitalize on this investment was greater network-wide facilitation to ensure that what was happening on a local level was known to and shared among all the network members. This happened toward the very end of the project, but everyone would have benefited had it happened more throughout the project. As work happened at local sites, members of the network could have participated in those efforts.

What also emerged from the past eighteen months of work is that, like other inquiry experiences, it takes time to develop skill and confidence in one's own ability to tinker, and even more time to develop skill in facilitating high-quality tinkering experiences for others. Individual staff members within TexNET at the end of this phase of work are all at very different depths of understanding and sophistication in relation to tinkering. In addition to differences at the level of the individual capacity, there are also varying degrees of institutional capacity to implement tinkering activities. At these places, even if individuals understand tinkering in the best case, they may not be able to implement

it because of lack of institutional support. In many ways, the work of TexNET in this second phase provided valuable initial opportunities among network members that can be built on in future work.

In terms of the evidence for longer-term sustainability of this state network, one TexNET partner is interested in pursuing a grant focused on providing professional development workshops in the region, an idea that was informed in large part by his museum's participation in this project and in ISEA.

In addition, the work of TexNET has spread to two other statewide museum networks through a shared connection with the Exploratorium. TexNET has influenced the thinking behind their networks and sparked a focus on tinkering work. It strikes us that there is tremendous potential in finding ways for TexNET and other state museum networks in the region to work together in the future. TexNET, the Oklahoma Museum Network and the Arkansas Discovery Network share an interest in tinkering experiences, and a strong connection with the Exploratorium. These three state networks also share similar rural audiences. It seems logical that future efforts build from the joint work of these three groups near the end of the TexNET project and involve at least some joint collaborative work across these three networks.

APPENDIX A:

MEMO SUMMARIZING PHASE ONE FINDINGS

January 3, 2008

TO: Charlie Walter, Fort Worth Museum of History and Science, Sandy Henry and James Nesmith, Science Spectrum; Lucinda Presley, Discovery Science Place; Melissa Cigarroa, Imaginarium of South Texas; and Bill Booth and Sam Dean, Exploratorium

FROM: Becky Carroll, Pam Tambe, Dawn Huntwork, Katherine Ramage, and Mark St. John, Inverness Research Associates

RE: Summary of TexNET to date and vision for future work

As the TexNET project enters its final phase of the current grant funding, we present this memo which summarizes the original vision, accomplishments and key issues, and challenges of the TexNET project to date. We also discuss some possibilities for future work. We see this memo being for internal purposes only – as writing that can help the TexNET members reflect on the work of the project thus far, and to help them in their planning for the future.

The Original Vision and Theory of Action

We thought it important to begin this memo by reviewing the original vision and theory of action of the TexNET project. The theory of action begins with NSF's investment of funds into the TexNET project. The principle institutions are the Exploratorium and Ft. Worth Museum of History and Science. Local "partner" museums are Discovery Science Place in Tyler; the Imaginarium of South Texas (formerly Laredo Children's Museum) in Laredo; and Science Spectrum in Lubbock. Ft. Worth serves as a "hub" or "node" for this new network of smaller museums that serve rural and "underserved" audiences, and orchestrates the programs that support these museums. The Exploratorium provides exhibits and, along with Fort Worth, helps to support a range of professional development opportunities to the "partner" museums for three years. TexNET is loosely modeled on the current ExNET project based at the Exploratorium which seeks to use exhibits to build institutional capacity in the participating partners. The three sets of exhibits, on weather, motion and sound, reflect the Exploratorium's values around the use of art, science and human perception to explore and interact with the environment. These sets rotate through the three partner museums – each with a one-year stint. In the original grant, it was proposed that professional development programs, including intensive institutes, exhibit-specific training workshops and

specialized capacity building workshops would help the museums develop interpretation of the exhibits, provide related programming, and build the capacity of their staffs.

There are four goals for this project. They include:

- 1) Providing more informal science and technology education opportunities for the audiences of partner institutions, with special attention to those who don't normally have access to those resources;
- 2) building local capacity;
- 3) creating more connections and relationships between participating museums and more broadly, other museums in the region; and
- 4) generating knowledge about this approach and formulating a "model" that could be used in other contexts to help museums network and build capacity.

Through exhibitry, public programming, and professional development, this project leads to greater access to high-quality learning experiences for visitors, staff, and others interacting with partner museums. TexNET increases the capacity of the smaller partner museums by contributing the imprimatur, connections, resources and experience of the Exploratorium and Ft. Worth. It increases the capacity of partner staff to provide high-quality learning experiences within their own communities, and creates mechanisms for partner museums to interact with each other, sharing expertise, in a sustained fashion. Thus, the partner museums, along with others in the field interacting with the TexNET network, build and then share expertise in terms of

- providing informal inquiry-based experiences for the general public, teachers, and other museum visitors;
- marketing new exhibits, programs and other museum resources;
- increasing the visibility of the museums in their communities;
- serving people traditionally under-served by museums; and
- networking with others in the region and in the broader museum field.

Finally, the broadest goal involves the generation of knowledge about this network model, which promotes the idea that it is possible to help small museums better serve their own audiences and at the same time develop their institutional capacity for continuing to serve their audiences beyond the work and lifetime of the grant.

The Partner Institutions

The three partner museums are quite interesting and different in size, number of staff, institutional capacity, audiences served, and needs. However, together, these institutions represent a spectrum of children's and science centers across Texas and the rest of the country.

Science Spectrum in Lubbock, Texas

Science Spectrum in Lubbock is the largest of the three museums, with a long-term director and stable board. The museum's biggest challenge over the years has been how to bring in new events and exhibits within a reasonable budget that will keep visitors returning; they have done so with special events, rotating exhibitions and education programs. A secondary issue has been staff turnover within the education department.

One of the biggest changes that has occurred at the Science Spectrum since the beginning of TexNET is the reconfiguration of the education department. The museum is in the process of moving from a staff of mostly part-time employees (primarily Texas Tech museum education students), to four full-time staff members.

Discovery Science Place

Discovery Science Place in Tyler is smaller than Lubbock but larger than Laredo. During its participation in TexNET, the museum has worked on refurbishing their new building across the parking lot from the original museum facility. The museum is still in the process of raising capital campaign funds (with a goal of approximately \$2 million) for the work yet to be completed – primarily for the atrium that connects the two buildings.

Most recently, the long-time director left and one part-time staff person who has been the most active in TexNET has taken a full-time position as the Arts/Science Director at the museum.

Imaginarium of South Texas

Laredo is the smallest of the institutions participating; since the inception of TexNET, this museum has re-conceptualized itself from a children's museum to more of a hands-on science center. The museum has moved from the local community college site to an 8,000 square foot space in Del Norte Mall, opening its doors in February of 2007. The move to the mall has enabled them to draw many more visitors and resulted in increased membership.

The museum is engaged in a \$25 million capital campaign to build a new permanent museum on the Texas A&M International University campus in Laredo. Perhaps most difficult, over the course of TexNET, the museum has twice seen a turnover in director and staff. One long-time board member has stepped in to act as director both times and has ensured continuity for the museum's participation in TexNET.

Key Accomplishments of the TexNET Project

The TexNET project has accomplished much over the past four years. The Exploratorium created three exhibition sets which are currently rotating through the three partner museums. The Exploratorium and Fort Worth have also been successful in providing an array of professional development opportunities and supports to the partner museums. These materials and professional supports have contributed to building the staff and institutional capacity among the partner museums. In turn, the partner museums have been successful in leveraging these resources to expand the repertoire of activities they offer visitors in their regions.

Exhibitions

The three partner museums are currently hosting their third exhibition which will be on their floors until late summer 2008. In general, the exhibitions have been well received and have been explored by thousands of visitors.

Having the exhibitions has resulted in substantial benefits to the partner museums. In several cases, having the exhibitions has spurred the development of new programming at the museums. At Tyler, for example, the exhibitions and related programming were so successful that it cemented a partnership between the local school district and the museum for all students in several grade levels to come to the museum to use the exhibitions and to participate in additional programming.

For both Tyler and Laredo, these exhibitions represent a fairly significant change in the style of exhibits their visitors normally interacted with at their institutions. For Lubbock, while they have this style of interactive exhibits, not having to rent more expensive traveling exhibitions every three to six months has been beneficial. For Laredo, hosting higher-quality, "polished" exhibits, funded by a national organizations, has been a great benefit in terms of raising funds, and also in terms of raising their overall profile in the community.

Professional development

Staff from Laredo, Tyler and Lubbock have participated in the annual Texas Association of Museums and Texas Informal Science Education Association meetings; received professional development at the Exploratorium and Fort Worth about inquiry teaching and learning; and received staff support to conduct teacher trainings and host "Mindfests." Staff from all three institutions also participated in the annual Association of Science-Technology Centers conference in Los Angeles in October 2007.

From all their professional experiences, staff from partner museums have gained specific activities and programming ideas that they have, in turn, gone back and implemented in programs with visitors at their own institutions. For example, staff who

participated in a one-week institute about Mindfests hosted by Fort Worth were able to return to their museums and put on similar events, supported by staff from Fort Worth.

Institutional benefits

Staff members from all three museums have increased in their capacity to make the most of exhibits with visitors, and to offer inquiry-based programming to visitors and teachers.

For example, the combination of having a set of exhibits around a central theme, the professional development, and the imprimatur of the connection with Fort Worth and the Exploratorium has allowed Tyler to solidify a relationship with the local school district. This resulted in an increase of over 6,000 visitors to the museum in one year. The school district viewed the project as so successful that it has continued the relationship and expanded it. In addition, recently, one staff person along with staff from the Exploratorium, conducted teacher training on art and science integration for elementary and middle school teachers in the region.

The point person for TexNET at Tyler explained the benefits of participating in TexNET to Discovery Science Place:

This [project] has been most beneficial for Tyler. It has legitimized us as a viable force in the science field and in the education field, and given us cache and increased credibility. It has helped us expand our audience. Because of TexNET we have this enormous education market that is coming to us...because we had the exhibits and created the programming around them... As a result, TISD and our region now are really interested in the art-science connection, the higher level, creative thinking.

For the Science Spectrum in Lubbock, a museum which houses exhibits similar to those in the TexNET exhibitions, the main benefit has come in having a thematic grouping of exhibits around which to offer programming. As one staff person said:

The one main value as far as the TexNET exhibits is the theme. People can get in there and go from one thing to another, so there is a depth of exploring a topic...

In addition, the on-site support provided by staff from Fort Worth, who worked with Science Spectrum education and floor staff on how to work with visitors around the exhibits, was important.

For Laredo, TexNET has been crucial to its shift in focus, from a children's museum to a science and technology center. Having the exhibitions from the Exploratorium has been important to demonstrate to visitors the new vision of the museum. As the interim director noted:

What has come out in TexNET is that we have a real need to try to make people more aware of what it means to be a life long learner, and the importance of exposure to science and a richer array of experiences. Especially underserved kids; they don't have opportunities to think outside the box. They come here and at least get to step outside what their normal limits are.

Issues and Challenges

While the TexNET project has accomplished much, there are also some challenges the project has encountered. These challenges include missed opportunities to work together, staff turnover and institutional instability, and technical issues with the exhibits.

Missed opportunities to be a network

In our studies of other networks, we have distilled the evidence of a successful network. This evidence includes:

- 1) Interaction between members: There is a "node" with connections to members of the network. The "node" helps members of the network get to know each other better than they would otherwise.
- 2) A relationship between members and node which is symbiotic and synergistic: Partner knowledge goes back to the node and then out to other members.
- 3) Interaction with the field: The TexNET node brings in experts to partners, and takes what is learned out from partners to the world through the node. The network as an entity can interact with policy and outside expertise.

The TexNET project has succeeded to some extent along several of these dimensions of evidence. However, there were missed opportunities to do more as a network.

For example, other than everyone gathering in Lubbock when all of the exhibits premiered, partner staff have had few structured, deliberate and intentional opportunities to visit each other's institutions. As one staff person said:

I have valued the trips to Fort Worth and San Francisco, but I think it would be good to see each other's museums...to make the rounds to see how each museum is using the exhibit, doing school tours. That would probably be the most helpful.

TexNET partners have also had little time at meetings and professional development offerings to simply talk together and share ideas about museum operations in general. They would like time to meet at each other's museums to share strategies and resources. As one person said:

One of the wonderful benefits of [participating in projects like this] is the bringing together of different partners, to have a constant stream of opportunities to come

together and learn from each other. We need to do this more often [with TexNET].

In addition, there were missed opportunities to do more work together when staff members from Fort Worth were providing professional development to specific partner museums. For example, staff from Fort Worth helped Laredo conduct a teacher training, offered floor staff training to Lubbock staff, and helped Tyler prepare for its first Mindfest. All of these site-specific professional development experiences might have been beneficial for other TexNET partner museums to participate in.

Staff turnover and institutional upheaval

All of the participating museums have experienced some form of staff turnover. Perhaps most notably, the TexNET leadership itself has sustained several key changes. Joe Hastings, who was the point person for the project from the Exploratorium, has left and is now a director at a science center in Amarillo, Texas. Chip Lindsey, another key project leader, has recently left the Fort Worth Museum of Science and History to work at another museum, as has Megan Adams from Fort Worth, who provided professional development to TexNET partners. Sam Dean has also recently moved from Fort Worth to the Exploratorium. There has also been turnover at the level of project assistant at Fort Worth.

In addition, all three of the partner museums have experienced staff turnover, and for one museum, that turnover has been significant. Staff who participated in TexNET professional development have since left the museums; this change-over in staffing diminishes the value of the resources invested in partner museums by this project.

In addition, Laredo's museum was closed temporarily during its transition from the community college site to the mall. And Fort Worth recently demolished their original building; staff are operating out of space at the nearby Cowgirl Hall of Fame museum as the new site is developed.

Technical issues with several of the components

Participating museum staff reported problems with several components within their exhibitions; these are exhibits that were also problematic at their previous locations. Staff reported that the Exploratorium has been responsive and helpful in addressing these issues. However, the partner museums do not have the electronics expertise to deal with these issues, nor should each museum have to solve the same problems the previous museum dealt with. As one museum staff person said:

It is hard for our exhibits staff person to get around and troubleshoot these exhibits. So the truth is, here we are three months in and there are exhibits in the closet. It is not an unwillingness on our part to do it, but it will take several days of time to fix this.

Laredo also reported that they had a lot of difficulty accessing and then working with marketing files to make them useful, appropriate and relevant for their site. They requested that these materials be made available on the website so that they are more easily accessible.

It also was unclear as to who the museums should contact – Fort Worth or the Exploratorium -- when they experience technical problems with the exhibits.

The technical issues with the exhibits are not a trivial matter. If these exhibits are costly and difficult to maintain, or if they don't work as intended, these museums may decide that it is not worth it to have these types of exhibits on their floors.

A Vision for the Future

To recap, while there have been significant benefits to the partner institutions, we think there is potential and opportunity to do more. We encourage the TexNET project to look at ways in which the participating museums can work and learn together more beneficially, and where a broader group of museums in Texas could share in the benefits of the network.

While having the exhibitions and professional development experiences around inquiry-based teaching and learning provides a strong foundation for the work, it seems to us that there is more specific work that could be done to meet the needs of the museums and the field. In addition, we wonder if this network may simply have been too small from the beginning. Finding ways to build on this nucleus and expand to include more institutions might be a profitable direction to go.

We have several ideas that might be of interest to the group. We would encourage the network members to think about these ideas but also to think about what their interests and needs are in relation to these ideas.

From our experience evaluating other networks and collaboratives, it is important to have a focal point of work, and more importantly, opportunity for participating museums to contribute to the focal point of work and also to benefit from it. This focal point could be something for the participating museums to do research and learn about. In this way, the playing field is level – everyone comes in learning about something together; they can experiment with implementing this new exhibit, program or approach at their home institutions, and then can return to the group to share their experiences. We speculate that these experiences would help meet a need of partner institutions, from providing better programs, to better teacher training, to better outreach. TexNET did provide this to some extent through the exhibitions. However, the exhibitions are not permanent, and to date, the project has not engineered enough ways for partner institutions to contribute to the network around the exhibits.

One idea is to have a PIE (Play-Invent-Explore)³-centered network of museums in Texas that would learn from the Exploratorium's PIE staff. In this way, the museums could experiment with PIE activities in their own institutions in the ways that helps them meet the needs they have – with teachers, on the exhibit floor, and in programming. From our point of view, there are several advantages to making PIE the center of TexNET's work. One advantage is that Fort Worth is a participating member in the PIE network project. In addition, it would allow other museums in Texas, several with considerable PIE expertise (Amarillo and Houston, in particular), to contribute to and learn from TexNET. We also think the nature of the PIE work makes it suitable to a variety of museum contexts and outreach settings.

Another idea that is not necessarily mutually exclusive to the PIE network idea is to have an outreach collaborative – a group of museums in Texas interested in learning more about how to do effective outreach with more rural and/or underserved audiences. By outreach, we mean museum activities that take place outside of the museum walls but are tied to the museum's offerings and philosophies, how to move beyond treasure hunts and "make-it and take-it" projects to a deeper type of outreach activity. This collaborative could involve the creation of table top activities, related programming and activities, and teacher training around core art/science themes shared by the museums. The Exploratorium could offer professional development (e.g., PIE institutes), table top exhibit ideas, and assistance with teacher training professional development. Perhaps there could be a core group of museums, and each museum who participates takes responsibility for one aspect (i.e., exhibits or teacher training) or one set of activities (i.e., the full set of exhibits, teacher training, designing particular activities around one theme). Then these resources could be shared. Or perhaps traveling PIE tinkering studios are disseminated at each of the sites.

Perhaps most important, critical to any of these ideas or any other ideas going forward is that there is clarity about the focus and the purpose of the work, and the roles and responsibilities of each participating member of the network. It needs to be clear how people are contributing to and gaining from their participation in the network. In addition, now more than ever, the TexNET project needs strong stewardship to guide the work, to provide support to the museums, to find ways to invite other museums into the work, and to sustain the project's work beyond the NSF funding.

We think it is important for the TexNET group to begin thinking about and experimenting with some of these ideas now, before the first grant ends. Doing so will help create a feasibility proof for important ideas and help gather evidence needed to pursue additional funding.

³ <http://www.exploratorium.edu/pie/>