CommunITy Studios Final Evaluation Report

Inverness Research
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CommunITy Studios helped get us ready to go into a working field. It helped us perform better in jobs and gave us leadership skills. We knew what to do, we had to contribute. Just getting us ready for the real world and the real workforce, ready to handle whatever comes our way.

CommunITy Studios Participant

INTRODUCTION AND BACKGROUND

The CommunITy Studios project at the Fort Worth Museum of Science and History was funded through the Innovative Technology Experiences for Students and Teachers (ITEST) program at the National Science Foundation (NSF) in January 2008. The ITEST program within the NSF is focused on helping young people build knowledge and skills to succeed in a technology-rich society. One of the primary interests of the program within the NSF is motivating students to enter a STEM career pipeline. The project was designed to build on work that began through a previous ITEST-funded project at the museum, Design IT, and off of the museum's participation in the Playful Invention and Exploration (PIE) Network and Institute projects[1] also funded through the National Science Foundation.

CommunITy Studios was designed to create a tinkering studio at nearby Trimble Tech High School, and to create and staff a similar studio space on the floor of the museum. In the studio at Trimble Tech, high school youth drop in after school and engage with college-age program coaches and adult staff in tinkering and materials exploration projects. Projects have included such things as taking apart toys and rebuilding them, creating chain reactions, building robots, geocaching, creating a digital photography portfolio, creating a haunted house, and developing programs for the portable planetarium. In the studio in the museum, youth from the Trimble Tech studio, program coaches, and staff facilitate inquiry and tinkering experiences for visitors to the museum. CommunITy Studios youth, program coaches and staff also helped to staff special events in the museum, help staff the museum school summer camps, and helped to staff, and provide the portable planetarium shows for the family science events program out in schools in the community. The well-scaffolded program supports the in-depth development of tinkering, teaching, and leadership skills among a core group of Trimble Tech High School participants, then

[1] For more on the PIE projects, see http://www.exploratorium.edu/pie.

employs them in the museum and outreach programs to facilitate inquiry-based tinkering experiences for visitors and event participants.

During the life of this project, the Fort Worth Museum of Science and History experienced a major transition -- the old building was torn down and a new one was built. The nearby Cowgirl Hall of Fame provided a small programming space for the museum during the transition. Another key area of transition over the course of the past four years was in staff -- most of the staff who had been involved in the predecessor Design IT and PIE projects left the museum. However, many of the Design IT youth participants were involved in the CommunITy Studios project, a key point of continuity.

In year three of the project, the Studio at Trimble Tech operated on Tuesday and Thursday afternoons from 3:00-6:30 p.m. This Studio was open for programming for 55 days and served 501 teens for a total of 1723 contact hours. Inventor Studio at the Fort Worth museum of Science and History is open seven days a week from 10:00 a.m. - 5:00 p.m. This studio welcomes children 8 years old and up providing activities for upper elementary, middle and high school teens serving an average 140 guests per day.

The Evaluation

Inverness Research[2] was contracted to conduct the formative and summative evaluation of the CommunITy Studios project. Our evaluation work has been qualitative in nature, and has included regular site visits to observe programming in both the school and museum studio spaces, as well as interviews with staff, program coaches and participants, and museum visitors. We provided informal formative feedback memos after major site visits, and annual reports that were largely formative in nature. The summative study included a final site visit where we conducted in-depth interviews with long-term program participants and staff, as well as follow-up telephone interviews with participants.

This Report

This final report presents a summary of our evaluation findings from the CommunITy Studios project. The report includes the following sections:

- Key Features of the Project
- Contributions and Benefits of the Project
- Challenges and Lessons Learned

[2] For more on Inverness Research, see http://www.inverness-research.org.

KEY FEATURES OF THE PROJECT

This section of the report documents the key features of the CommunITy Studio project.

Making/Tinkering Experiences

The core of the student experience in this project is youth engaged in tinkering or making things, using science, technology and engineering processes to take things apart, build things, and inquire into materials. The museum, through its participation in the PIE project and the original ITEST Design IT program, has engaged in learning about, and becoming involved with, a larger community of "makers", people engaged in an inquiry into materials, art, science, and the design process. The larger making movement that includes such things as hackerspaces, Make magazine and Maker Faire, has been described as a merger of "DIY (do it yourself) with technology."[3] Thus, the experience at the Trimble Tech studio in the drop-in program, focuses on youth engaged in long-term, materials-based explorations, generally involving technology. For example, in the first year of the program, Trimble Tech participants spent eight weeks creating involve chain reactions; part of their chain reactions involved the creation of a variety of different kinds of switches, some used with PicoCrickets -- small computers that utilize simple programming that can switch on a motor, turn on a light, etc.[4]

Similar, in-depth types of explorations are offered to visitors in the Inventor Studio within the museum, although not as materials' rich and tool-demanding as those offered in the drop-in program at the high school. We will discuss the experiences in both of these spaces in more detail in the sections that follow.

Museum and Community Spaces and Activities

One important feature of the project was that it involved activities both in the museum and out in the community. The main "in-museum" activity was the Inventor's Studio space in the newly-renovated museum (this space opened to the public in the early winter of 2010). This space is one of five studios at the heart of the museum that offer visitors opportunities to engage in more in-depth programming and activities than a typical exhibit experience. In the Inventor Studio, visitors can build chain reactions with dominos, create animations on computers using the Scratch animation program, create stop-motion animation movies, and build simple circuits, for example. CommunITy Studio staff, program coaches, and youth serve as staff in this space, facilitating visitors explorations and experiences. Also in the museum, CommunITy Studios staff, program coaches and

[3] Lahart, Justin. *Tinkering Makes Comeback Amidst Crises*. Wall Street Journal online. See http://online.wsj.com/article/SB125798004542744219.html

[4] For more on PicoCrickets, see http://www.picocricket.com.

youth serve as teachers and assistants in the museum-school summer camps, and staff special events.

CommunITy Studios also has a strong presence out in the community as well. In addition to the studio space at Trimble Tech High School, the CommunITy Studios project has provided summer making/tinkering experiences at Ridgmar Mall. The project also contributed a portable planetarium and activities for family science festivals at elementary schools in the region, and near the end of the project, provided additional after-school programs at other local high schools.

Long-Term Relationships with Youth

Many of the core participants were actively engaged with the CommunITy Studios project for nearly four years, attending the drop-in program several times a week, and being at the museum on the weekends and in the summer. Several had been active participants in the predecessor Design IT project, resulting in youth who had been engaged with the museum and its staff in designing and tinkering activities for six-to-eight years. The project provided opportunities not only for these youth to continue to stay engaged with the program over many years, but also provided appropriate leadership opportunities for youth as well. Core participants were invited to become leadership interns, who were paid a stipend to help plan activities in the studio space. Those youth that continued on were invited to become junior program coaches and program coaches, taking on additional responsibility for mentoring younger students in the program and facilitating their tinkering experiences.

Mentoring

The structure of the mentoring was another key feature of the CommunITy Studios project. Youth in the studio space at Trimble Tech were mentored by college-age program coaches who, in turn, were mentored by young adult staff. In addition, the project involved other long-term museum staff. There were numerous layers of experience and levels of expertise built into the project, and therefore, numerous opportunities for youth in the project to make positive connections with a range of adults who could serve as their mentors.

CONTRIBUTIONS AND BENEFITS OF THE PROJECT

In this section of the report, we summarize the contributions of the project to the youth who have participated, to the program coaches, and to the museum and its visitors.

Contributions to Youth Participants

The project was overseen by the principal investigator, and three full-time staff -- young adults with teaching, youth development, and counseling experience. Indirectly, through the facilitation of activities in the studio spaces, the program also served thousands of museum visitors.

The project clearly hoped that youth participants, through their own tinkering, making and problem-solving opportunities, would gain confidence and an ability to facilitate others' tinkering and inquiries. The core group of long-term participants have benefitted tremendously from their participation in the CommunITy Studios project. They have learned key 21st century technology and problem-solving skills working through various aspects of the longer-term projects (such as how to wire LED lights on a sign). They are quite proud of all they have learned and accomplished at the studio.

The emphasis on tinkering, hands-on engagement and problem solving, is noteworthy. These activities are emphasizing the types of skills widely recognized as needed in today's STEM workforce. For example, the Partnership for 21st Century Workforce Skills[5], a leading advocacy organization promoting 21st century skills in education, states that "A focus on creativity, critical thinking, communication and collaboration is essential to prepare students for the future." This group notes the following creativity and innovation skills in their skill-development framework:

Think creatively

- *use a wide range of idea creation techniques (such as brainstorming)*
- *create new and worthwhile ideas (both incremental and radical concepts)*
- *elaborate, refine, analyze and evaluate their own ideas in order to improve and maximize creative efforts*

Work creatively with others

- *develop, implement and communicate new ideas to others effectively*
- *be open and responsive to new and diverse perspectives; incorporate group input and feedback into the work*
- *demonstrate originality and inventiveness in work, and understand the real world limits to adopting new ideas*

[5] For more on The Partnership for 21st Century Workforce Skills, see their website at http://www.p21.org.

- *view failure as an opportunity to learn; understand that creativity and innovation is a long-term, cyclical process of small successes and frequent mistakes*

Implement innovations

- *act on creative ideas to make a tangible and useful contribution to the field in which the innovation will occur*

The core group of youth have clearly benefitted from their long-term participation in the project and have gained skills along the dimensions outlined above. They are articulate, outgoing, confident, and self-assured. We have had the opportunity to conduct interviews with this core group of participants twice a year for every year of the project. We have observed a steady maturation of these youth -- growth in their self-esteem, problem-solving capabilities, confidence, communication and facilitation skills and in discerning what fields and kinds of college/career/work goals they are most interested in pursuing.

Confidence

CommunITy Studios staff, Trimble Tech teachers, and the youth themselves all noted how much the long-term participants had gained in confidence through the course of their participation in the project. Their experiences in the project -- from experimenting and tinkering and learning to trust their creative and design process skills, to their interactions with caring adults who supported their risk-taking, to working in the museum to facilitate visitor experiences -- all contributed to the development of students' confidence. Staff noted that many of the students had "come out of their shells" and were "wise beyond their years."

Two long-term participant said:

> *Being in the program taught me to be more open to different ideas, and more sure of myself.*
>
> *I never saw myself as being able to make a robot. I was amazed! Artful, electrical and scientific -- all at once!*

Creative and Design Thinking Skills

Almost all of the students we interviewed said that having a space to create things and express themselves creatively was one of the best things about participating in the studio:

> *The most interesting thing was being the creator of something and showing other people what I did.*

[The best things about coming here is] being able to bring your ideas to life. I like it because I can express myself more here than I can in other parts of my life.

You are free to do what you want to do here. You have the opportunity and the stuff to work with.

One youth began to design jewelry and hair bows out of solder; the project director encouraged her by providing jewelry making supplies. Another youth has been pursuing his interest in movie-making, creating short films for a museum staff person about the studio spaces, and making a film. As one participant noted,

I love how this place lets you express yourself. There aren't too many places in high school where I can be myself and be creative, and show the world that.

Two of the long-term participants we interviewed at the end of the project still vividly remembered the chain reactions they had created three years earlier. This appears to have been a very profound experience for the participants. One participant who is now in college studying pre-med, described his chain reaction he had made as a high school junior:

The purpose of my chain reaction was to knock down dominoes that said CommunITy Studios on them. I started with this long tubing coming down in a loop that held ball bearings. I had them at a pretty good angle and they would fall about four feet into a cup that was part of a scale. When it got heavy enough, the cup tipped, and the balls headed down a ramp and hit dominoes. The last domino that fell was covered with foil and I wired it to be part of a circuit. I put another piece of foil on the surface where the domino was falling and that set off a little machine. The machine started winding up and lifted up a box and when it opened enough, a bigger marble popped out and hit inside a tube of a funnel and when the funnel came down, it hit a domino that triggered the CommunITy Studios sign. I felt like all the ideas I had, I got to put into it. I had enough time to work on it and I was really happy with the final project. It was one of those lifetime experiences that it's hard to forget.

Another memorable project was in the fall of the second year, when the CommunITy Studios students and staff turned the studio space at Trimble Tech into a haunted house:

It was awesome. We had so many different ideas. I learned a new way to make the lights, how to use LED lights to make bat eyes glow. That was really neat and cool.

Many of the participants spoke of the patience they learned while doing the design activities, and how much they learned from being frustrated and persevering. These

are skills that will serve these young adults well as they work their way through college and into careers. As one participant said:

> *One of the big things I learned is patience. The frustration when it wouldn't work and you would have to keep trying and trying and trying. And it just taught me not to give up when you want to do something. It gave me that state of mind when I'm determined to do something that I don't give up. I've got to keep trying until I get it right.*

Facilitation/Communication Skills

The long-term participants became expert facilitators of museum visitors' experiences in the Inventor Studio. Having their own rich tinkering and materials exploration experiences helped them understand well what visitors were experiencing, and enabled them to quickly and readily ask just the right question, or engage in side-by-side modeling that helped visitors take the next step in their explorations. We never observed them taking over for the visitor, or giving the one right answer, but rather, we observed them asking questions, watching and offering a material or tool at just the right moment. These facilitation skills take practice over time to learn -- something the project has afforded the long-term participants.

One long-term participant spoke about the value of having to interact with so many different kinds of people in the museum:

> *Working with so many different kinds of guests at the museum was a big learning experience. I would know when to approach them, when to help, how to reach them if they were struggling with something and just didn't want to ask for help. I'm more direct with people now. If ever I am in a group, I tend to speak a lot more, and I try to bring everyone together to accomplish what we are doing.*

Tool and Technology Skills

Over the course of three years, Trimble Tech participants were exposed to a wide variety of tools and technology. Youth in the CommunITy Studios project learned how to solder, use drill presses, learned about digital photography, electronics, Scratch animation, filmmaking, and experimented with Picocrickets. They became quite comfortable using both tools and technologies. Two youth we interviewed early on in the project said,

> *I didn't even know what soldering was at the beginning. And now I can do it! And it is cool!*

We have been working with electronics a lot here (at the studio)… and studying it in my classes… I can understand what they are teaching me in class because of working with it here. And my grades are better, too, which is good!

Early on in the program, one student brought a drum set from the video game Rock Band from the library to the studio to repair. He did this of his own initiative; he saw that it was broken and offered to fix it. His confidence in being able to fix anything speaks volumes for the opportunities the studio programming has provided him, and how it has impacted his thinking. He told us:

It's no big deal. I just have to re-connect this part to that, and solder that, and then find a way to get this piece back on there. There's no point in having it if it doesn't work.

Another long-term participant noted she had "learned a lot through the program," including learning about electricity, stripping wires, why a certain number of LEDs is required for use with a nine-volt battery: "too few and the LED burns up; too many and they won't light."

Career Awareness

At the drop-in studio at Trimble Tech, adults working in science and technology fields and people who are involved in technology-rich hobbies gave presentations to youth. For example, members of a robotics club came and spent an afternoon with the youth. Exhibit developers from the museum also spent time in the studio with youth, sharing the ways in which they use science and technology on a daily basis.

Several students have graduated from the program and are pursuing STEM college degrees. One student received a scholarship to the University of Texas-Arlington to study mechanical engineering:

I received a scholarship for being the best student in electronics. I am going to go to UT Arlington and try to major in mechanical engineering.

Positive Relationships

For many of the students, the other people at the studio–the students and the adults–are a key component of the studio. Students formed highly positive relationships with other participants in the program, with the program coaches, and with the adult staff. As several students said:

I made more friends here. I wasn't sure if my friends would want to come here. But some of them did. And then I made more friends here.

[The best thing about the studio is] the people! All your friends are here. Even the grownups are awesome! They're your friends too!

The youth value the relationships, and know that the adults they work with value them too. One youth spoke about the importance of the relationships with adults in the studio program:

Rebecca, Dan and Jennifer -- I can't describe how much I loved working with them. They were our bosses and they made sure we knew that they wanted it done right. But they didn't yell at us. If you had any personal problems, school problems... they were there for us.

The best part about coming here is all the people. This attracts good, fun people.

I love the environment here. You walk in and people are working on things. In other places, that might be awkward, but here, you want to jump right in and give people a hug.

The youth also have gained because of the positive relationships they have had with museum visitors. One long-term participant told us about a three year old boy who comes to the Inventor Studio every week with his grandmother. She told us how she started working with him, and every week, he would come in and look for her, asking for her to work with him while he was in the studio:

Every Wednesday, he came to the museum and wanted to play with me on the computer. I love working with the kids. I have learned so much from them!

Another long-term participant talked about the win-win relationship that comes from working with visitors:

You inspire students and they inspire you.

Several of the long-term youth mentioned that the relationships they had formed -- with adults, their peers, and museum visitors -- were going to serve them well in their futures. As one participant said,

What I liked best was interacting with peers and new people. When I go to college, I will be able to do this. The world is huge. When you get to know people, there's no limit to what you could do. You can't buy your connections.

Contributions to the Program Coaches

The program coaches, college aged youth who were paid to facilitate experiences in both the Trimble Tech and museum studio spaces have benefitted from the program as well. They have found new areas of interest, enjoyed the connection they have

with the youth participants, and have learned new things through their own tinkering side-by-side with the students. They have gained confidence and leadership skills as well. For example, one of the program coaches became interested in geocaching since working on that program cycle at the studio. Another learned how to solder from one of the female participants at the studio.

Two of the program coaches interviewed talked about how they have benefitted from their involvement with the project as well:

> *Being able to talk with people is a real benefit. My people skills have grown. I was really shy and this helped open me up. Being able to program things, to fix things, those kinds of practical skills are good too. And I like the relationship I have had with some of the kids at Trimble Tech.*
>
> *This has taught me a lot of leadership skills – how to work with people, talk with people, and get along with other people.*

Contributions to the Museum

Since the new museum opened, several of the core group of Trimble Tech students have been working as paid staff in the Inventor Studio. These youth are engaged in facilitating tinkering and inquiry experiences for visitors to the studio space, applying the tinkering and inquiry experiences they have gained from their time in the studio at the school. These youth are gaining valuable leadership and teaching skills, and bring a youthful energy to the studio spaces. These largely minority youth also bring diversity to the museum and its outreach efforts as well. One youth participant spoke of the value of having the CommunITy Studios youth working in the museum:

> *We are all so unique and different. We help work with people and show them things.*

The community benefits from seeing these local youth staffing the museum. As one Trimble Tech teacher noted:

> *When I go to the museum with my family and friends, it is really good to see Trimble Tech students working there.*

CommunITy Studio youth and staff have helped provide additional staff to numerous public events, both at the museum and out in the community. In addition, they have broadened the repertoire of activities the museum offers, not only in the studio spaces, but through other programs as well. For example, involvement of CommuniITy Studio staff and youth participants with the summer camps helped develop a strand of summer camp programming that was more technology based. This would not have happened without CommunITy Studios. As the PI said,

Our early childhood educators don't have that background.

In addition, CommunITy Studio staff helped plan and deliver distance learning program for high school aged youth. CommunITy Studio youth have also been recruited by museum staff to assist with special projects. One long-term participant who has an interest in film-making was recruited by a museum staff person to create publicity videos that highlight the museum.

One CommunITy Studio participant who had taken an EMT course helped determine that a woman visiting the studio was having a stroke. Because he knew the signs of a stroke and the quick tests to administer, museum staff was able to get emergency personnel to the museum quickly.

Visitors to the Inventor Studio generally spent a great deal of time in those spaces engaged in the activities. We observed over a several day timespan visitors spending up to an hour in this studio space, working with the activities, each other, and often, the staff. The CommunITy Studios youth brought energy to the museum and studio space, and working there, in turn, energized the youth. As one long-term participant said:

> *I had a lot of energy [at the museum studio]. I could be feeling like garbage that day, but the guests would come in and I felt like it was my job and responsibility to make sure they enjoy their visit. I would go up to them and have to be really energetic and help them enjoy their stay there.*

Another noted how she brings creativity and new ways of doing things to the museum:

> *I think I bring new, creative ways to seeing (and doing) something... I add something new, even if it's random or a different way.*

CHALLENGES/LESSONS LEARNED

Despite the clear benefits to youth participants and the museum of the CommunITy Studios project, the project will not be sustained beyond the end of the grant. Elements of the project are likely to continue, such as the programming that was developed in the Inventor Studio and the portable planetarium work at family science events, but the core of the program -- the after-school drop-in program -- will not. There are numerous reasons for this part of the project ending, including a shift in the culture and staff at the museum, staff turnover, and loss of the studio space at Trimble Tech.

Larger Museum Context

The CommunITy Studios project grew out of projects that were part of the "old museum's" culture and way of doing things. The grant was written before the demolition of the museum and the turnover in staff. With a new museum director on board and a new facility, there have been subtle shifts in the culture and priorities of the museum. This is not an uncommon phenomenon when museums create new spaces for themselves, and when significant staff changes happen. While the new studio spaces were moved from the basement and back of the old museum to a front-and-center location in the new one, signaling a priority for this type of experience, it wasn't always clear for those implementing programming in the studio how much tolerance there was for messy, materials-based explorations in these glass-walled studios. As one long-term participant noted:

> *Personally, I liked the old museum better. It seemed like there was more to do. Now it is more about the look, not so much about the fun and the experience.*

Staff Turnover

For the first two years of the project, staff turnover was a major challenge. The staff who work directly with the youth were different in every year of the project until near the end of year two. The fact that the core group of youth stayed with the program throughout its entirety despite the staff turnover is a testament to the benefit they saw the activities of the program making to their lives.

The staff turnover also inhibited the development of the project in its first few years -- new staff coming on resulted in the project feeling like it had to "ramp up" anew every year, and lessons learned from one year of the program had to be re-learned the following year by the new staff.

A related issue was the staff turnover that took place within the larger museum, where many of the staff with tinkering expertise who had gained from professional development experiences through the previous NSF-funded projects left the

museum. This was a pool of people who might have been extremely helpful to the project.

Relationship with Trimble Tech and Fort Worth Independent School District (FWISD)

While Trimble Tech High School provided a space for the studio programming in the first few years of the project, and the science chair, one counselor and a few teachers were avid supporters of the program, there was not enough buy-in from the administration or the larger FWISD for the program. The studio space at Trimble Tech was an old cafeteria that museum staff renovated to fit the needs of the CommunITy Studios project. Near the end of year three, FWISD decided to begin a culinary arts program at the school, and reclaimed the studio space, resulting in more limited year four programming at Trimble Tech that rotated among teacher's classrooms. The ultimate outcome may not have been preventable; however, we think more relationship building work throughout the life of the project needed to happen to prove the worth of the program to the administration at Trimble Tech and FWISD.

Recruiting Participants

The CommunITy Studios project had a solid core group of participants who faithfully attended studio programming every week. There was also a small outer-circle of participants who attended more sporadically, as well as a few youth who dropped in only once or twice a semester. Most of the participants who came to the studio came because a friend or sibling was a regular attendee. When the group of three staff people came on mid-way through year two, they made regular efforts to recruit participants to the studio at school lunches. However, the project was never able to reach a larger population of youth at Trimble Tech. The staff turnover in the early years of this project likely hurt the recruiting efforts.

Overstaffing

At times, the project employed too many staff people. We observed some events where there were two adult staff, and up to four program coaches/junior program coaches working with 20 other students. The result was that there wasn't enough to do, and the junior program coaches ended up standing around talking to one another. While these types of materials- and tools-rich activities do need a high staff-to-participant ratio, there is a careful balance that needs to be struck to ensure that those who are paid to be there are truly needed.

Proving Value

CommunITy Studio staff, program coaches and leadership council youth served as general staff support at numerous museum events, both in the museum and out in

the community. One way to make a program invaluable and sustainable is to be always at the ready to support other efforts at the museum. Another way is to stick to a core set of beliefs and work and do that very, very well. Because the project had a wealth of staff built in, it spread itself thin trying to provide general staffing throughout the museum. What it wasn't able to do effectively, which ultimately hurt its long-term sustainability, was prove the value of its core work to the larger museum and community.

SUMMARY

Building leadership and workforce skills within youth, we believe, best happens with these kinds of program designs – deep, long-term work with a core group of participants, who in turn, share their learning and experiences as they facilitate inquiry work with visitors in the museum. With mentoring and role model support from program staff with a passion and deep dedication, the core group of youth served by this project clearly benefited from their experiences in the program, in ways that will help them be productive in the future, even if they are not going into the STEM career pipeline. The museum clearly benefited from the program, particularly in having minority, energetic youth engaged in facilitating rich materials-based experiences for visitors. It would have been difficult for the program to be sustained long-term in the face of a changing museum and school district context. The fact that several of the core youth are still working as paid staff at the museum in an important legacy of the project.