PATHWAYS TO BRIGHTER FUTURES

WHAT IS STEM?   VIDEOS   HISPANIC COMMUNICATIONS NETWORK

PATHWAYS TO BRIGHTER FUTURES THROUGH STEM CAREERS INTRODUCES NEW MEXICO TEENAGERS TO VARIETY OF OPPORTUNITIES IN SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM).

VIDEOS

Final Report

Pathways to Brighter Futures
Through STEM Careers

A Pathways project funded by the National Science Foundation
Division of Research on Learning in Formal and Informal Settings (DRL)
Advancing Informal Science Learning (AISL) Program

December 15, 2013

Carlos Alcazar, President & CEO
Alliyah Noor, J.D., Program Manager
Rebeca Sobel, Project Manager
Nicole Morgan, Project Assistant

Hispanic Communications Network

Valerie Knight-Williams, Ed.D., Co-Director
Divan Williams Jr., J.D., Co-Director
Rachael Teel, MESc., Senior Research Associate
Gabriel Simmons, Research Associate
Kayla Roy, Research Assistant

Knight Williams Inc.

Lynn D. Dierking, Ph.D., Associate Dean for Research, College of Education
Sea Grant Professor in Free-Choice STEM Learning, College of Science

Oregon State University

Table of Contents

Introduction

Hispanic Communications Network (HCN), the largest Spanish-language educational mass media organization serving Hispanics in the United States, designed the *Pathways to Brighter Futures Through STEM Careers* (*STEM Pathways*) project to: engage at-risk and incarcerated Hispanic teens around STEM jobs/careers; increase their understanding of the education, training, and skills needed to attain these jobs/careers; and encourage them to see such a path as a future possibility for themselves (Neelum et al. 2009).

Funded by the National Science Foundation (NSF), the project's primary strategies involved media activities, art activities, and flash mentoring with STEM role models. This report presents findings on the use of these activities with at-risk Hispanic youth in Santa Fe and Albuquerque, New Mexico, most of whom were currently (or had been) incarcerated.

The *STEM Pathways* team centered on this set of media, art, and flash mentoring activities for two primary reasons: because of HCN's 25-year track record working in Hispanic communities using diverse communication platforms and community-based partnerships, and because of research indicating that these particular activities can be effective ways to engage and influence at-risk youth. (Heath and Smyth,1999; Barker, 2009; Ito et al, 2008; Hahn, 2002; Deasy, 2002; Fleitman, 2012; Tierney et al, 2000; National Mentoring Partnership, 2005; Jekielek, 2002; Neglected or Delinquent Technical Assistance Center, 2008). The project further drew on the positive youth justice literature, which suggests that programs for positive youth development are successful when they offer delinquent and at-risk youth the following: (1) a sense of safety and structure; (2) a sense of belonging and membership; (3) a sense of self-worth and social contribution; (4) a sense of independence and control over one's life; and (5) a sense of closeness in interpersonal relationships (Butts et al., 2010; Halpren, 2005; Benson, 2002).

As an NSF-funded Pathways grant, the *STEM Pathways* project prioritized the "design, development, and testing" of components of the Division of Research and Learning (DRL)'s cycle of innovation, in general developing and testing innovative work that is on a path toward a major Advancing Informal Science Learning (AISL) project (Research, Full-Scale Development, or Broad Implementation). Accordingly, the project's evaluation approach was designed to be collaborative and flexible, as well as ongoing and iterative, as follows:

- *Collaborative and flexible*: The evaluation relied on an ongoing collaborative effort between the project team from HCN and an independent evaluation team from Knight Williams Inc., a firm specializing in the evaluation of informal science media and outreach projects that target diverse audiences. The project and evaluation teams collaborated on all activities as they unfolded over time. This approach was appropriate given that an AISL Pathways project is focused on design, development, and testing. Additionally, the intensity and short duration of the project period required regular contact between the project and evaluation teams, and quick decisions about the development of materials and programming. This collaborative approach also supported the project team's goal of building internal evaluation capacity as a foundation for pursuing a full-scale development or broad implementation project in the future.

  The collaborative process required that the evaluation team be flexible and responsive to the project's development and implementation schedule. In general, the evaluation team took the lead on drafting required surveys and observation and interview protocols, analyzing and interpreting data, and reporting findings. Local project team staff members were responsible for providing input

on all instruments and adapting them as needed; coordinating local evaluation procedures; implementing activities that involved face-to-face data collection; and assisting with data organization and entry. The evaluation and project teams also collaborated on the final report to ensure project findings were communicated in a manner that was internally useful, accurate, and methodologically sound.

Ongoing and iterative: Given the design, development, and testing cycle of an AISL Pathways project and the numerous activities to be evaluated as part of the 1-year grant period, the evaluation activities were designed to be responsive, iterative, and ongoing rather than conducted in distinct formative and summative phases. Given the budget, time, and scheduling constraints of AISL Pathways projects, the *STEM Pathways* team ultimately aimed for the evaluation to generate evidence of the project's potential impact, as opposed to evidence of specific impacts.

Background

In order to determine the goals, objectives, activities, and evaluation strategies of *STEM Pathways*, the project and evaluation teams conducted a literature review of relevant youth development research to help inform the project's planning phase. The literature review focused on 3 areas of research:

- Relevant theoretical frameworks, including positive youth justice, possible selves, social cognitive theory, and emerging adulthood;

- Empirical research on youth and young adult development, delinquency, and vocational aspirations; and

- Evaluation and development work on the use of media, art, and flash mentoring strategies to promote STEM career awareness and engagement among at-risk and incarcerated youth.

To supplement this work, the project team also prepared "partner profiles" of the youth-serving organizations selected to partner with HCN. The project and evaluation teams reflected on the literature review and partner profiles in order to develop program goals and activities and draft a project logic model (see Appendix 1). The teams revisited the logic model periodically over the course of the project, to allow for shifts as the AISL Pathways project evolved.

Project goals and objectives

The project's planning phase resulted in *STEM Pathways* centering on the following 4 goals:

1) *At-risk Hispanic youth will increase their awareness and knowledge about STEM careers and the education, training, and skills needed to attain them.*

2) *At-risk Hispanic youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area.*

3) *At-risk Hispanic youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/visioning art directives.*

4

4) *At-risk youth-produced social media about STEM careers will develop leadership & communication skills among At-risk Hispanic youth.*

The team then developed the following objectives for each of the 4 project goals. The specific activity or activities linked with each objective are noted where applicable.

1) *At-risk Hispanic youth will increase their awareness and knowledge about STEM careers and the education, training, and skills needed to attain them.*

   ▪ Youth will indicate that they enjoy doing the [*media, art, role model*] activities and be able to describe what they most enjoy
   ▪ Youth will report that they are comfortable doing the activities [*art activity*: sharing and discussing what they made, *flash mentoring activity*: asking the professionals questions and participating in discussions]
   ▪ Youth will indicate they enjoy meeting the professional role models and will be able to describe what they most like about meeting them
   ▪ *Flash mentoring activity only*: Youth will indicate that they enjoy hearing the professional role models talk about their work
   ▪ *Flash mentoring activity only:* Youth will indicate they enjoy watching the professional role models' demonstrations
   ▪ *Flash mentoring activity only*: Youth will indicate that they can relate to the professional role models
   ▪ *Flash mentoring activity only*: Youth will be able to describe 2-3 types of technical STEM-related jobs that are a possibility for them, currently and in the future
   ▪ *Flash mentoring activity only*: Youth will share understandings of careers in general, and STEM careers specifically, in their own words with peers

2) *At-risk Hispanic youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area.*

   ▪ Youth will share enthusiasm that working in a STEM-related job is a possibility for themselves and others
   ▪ *Flash mentoring activity only:* Youth will indicate that they have a better understanding of what is involved in working towards a STEM job/career after participating in the activity and will be able to explain why this is the case
   ▪ *Flash mentoring activity only*: Youth will be able to describe the most interesting things they learn from the professionals they meet
   ▪ *Flash mentoring activity only:* Youth will indicate that the professionals participating in the program are good role models for themselves and their peers, and will be able to explain why this is the case
   ▪ *Flash mentoring activity only*: Youth will be able to identify which of the jobs/careers they hear about during the activity stand out for them as most and least interesting, and explain why

3) *At-risk Hispanic youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/visioning art directives.*

- *Flash mentoring activity only*: Youth are prepared for real-world interviewing sessions and empowered as they ask role models standard interview questions
- *Flash mentoring activity only*: Youth will know at least 1 contact person who works in a STEM-related career with whom they can follow up
- *Flash mentoring activity only*: Youth will indicate that their interviewing skills improve as a result of participating in the activity and be able to explain why this is the case.

4) *At-risk youth-produced social media about STEM careers will develop leadership & communication skills among At-risk Hispanic youth.*

- Youth will develop further interest in STEM jobs
- Youth will develop media, leadership, and communication skills
- Youth who watch videos will be inspired to see STEM careers as more likely possibilities for their futures
- Youth-produced social media will support peer-to-peer learning opportunities

Partner Organizations

Four organizations served pivotal roles in the development and implementation of the *STEM Pathways* project. A brief description of each organization is provided in the sidebars to the left and on the following page.

The evaluation findings presented in this report are based on work conducted with youth in the Youth Development Program (YDP) and Youth Development Inc. (YDI). In addition to allowing the project team access to youth participants, these organizations also provided the facilities for most of the media, art, and flash mentoring activities implemented during the project.

Methods

Evaluation strategies

The project and evaluation teams continually reflected on the project's literature review, logic model, and partner profiles, as they were being developed, to devise evaluation strategies that could yield data to both inform and refine the project's unfolding activity sessions and future directions.

The evaluation strategies designed for use during the youth media, art, and flash mentoring role model activities incorporated: (i) the use of detailed note-taking of project sessions to assess implementation fidelity, document session highlights and challenges, and informally capture youths' verbal feedback; and (ii) the use of pre- and post-activity surveys completed by participating youth. Both strategies were coordinated and implemented by a member of the project team who served as an internal evaluator for the project and consulted directly with the external evaluator.

Two additional evaluation strategies were used to assess the flash mentoring role model activities and the video-creation component of the media activities. For the role model activities, the participating role models were invited to complete an online survey prior to and following their sessions with the youth. For the video creation component, participating youth from YDI were invited to complete a follow-up online survey at the conclusion of the project.

Survey items

Although the evaluation team would typically aim to select or adapt STEM knowledge, interest, and opinion survey items from nationally validated sources when evaluating AISL projects, the team was limited in this regard given the project's short timeline, available resources, session scheduling constraints, and the lack of available instruments on the use of media, art activities, and flash mentoring activities with incarcerated and at-risk youth. However, the team was able to adapt some questioning strategies from those used by researchers experienced with assessing at-risk youth vocational identify, career aspirations, and possible selves (Butts et al, 2010; Gushue et al, 2006; Jensen, 2000; Lindeman, 2010; Lyon et al, 2012; Oyserman and Fryberg, 2006; McCarty et al, 2010; The Quality Education for Minorities (QEM) Network, 2010; Yowell, 2002).

Reflecting on this work and the project team's evolving programming needs, the project and evaluation teams developed a set of survey questions for youth to complete before and after participating in the activity sessions. Given the timeline and scheduling constraints referenced earlier, it was necessary to develop the evaluation strategies while the project's goals and objectives and the logic model were being drafted and sessions were being scheduled.

Listening sessions conducted with the partner organizations profiled in the sidebars to the left and on the previous page helped inform question strategies and wording. Subsequently, once the project team launched its initial sessions, the project and evaluation teams reviewed and discussed the session notes and an overview of the youths' responses to the evaluation questions during weekly team meetings. Through this process the teams were able to informally pilot test the evaluation questions with youth and make necessary revisions to address issues of length, clarity, and readability.

The surveys were designed to be generally consistent across sessions, following the objectives outlined on pages 5 and 6, and in the project's logic model (Appendix 1), but in some cases, where noted, specific questions were asked of youth in specific sessions. Given the tight nature of the project schedule and the need to complete activities when partner organizations could hold sessions, the priority was placed on obtaining as much feedback as

possible about individual activity sessions as they arose, instead of implementing a more formalized evaluation of a given set of sessions. One drawback of responding to the needs of specific sessions in this manner is that it precluded the opportunity to implement the evaluation in a more systematic or controlled way. Not all project objectives were evaluated as thoroughly or as consistently as would have been possible with additional lead and planning time to select sites, devise a sampling strategy, and pilot procedures. On the other hand, the iterative nature of the feedback was invaluable in informing the project team's decisions over time, which was deemed the higher priority.

Survey administration

As noted previously, a member of the project team served as a liaison to the independent evaluation team and was responsible for administering surveys and taking field notes at the local level. Both verbally and in the survey instructions, youth were told their feedback was anonymous, that there were no right or wrong answers, that their frank and honest feedback was appreciated, and that their input would help improve future *STEM Pathways* programs.

Analyses

Basic descriptive statistics were performed on the quantitative data generated from the surveys. Content analyses were performed on the qualitative data generated from the open-ended questions. These analyses were both deductive, drawing on the project's goals and objectives, and inductive, looking at youth participants' responses for overall themes, keywords, and key phrases.

Limitations

The evaluation findings reported here are based on surveys collected from youth who completed both pre- and post-activity surveys at the media, art, or flash mentoring role model session they attended as part of the *STEM Pathways* project. A number of limitations should be kept in mind when interpreting the findings, given the fast onset and pace of the programming schedule, the learning curve faced by the project team in coordinating with the YDP and YDI organizations and implementing the program activities, and the iterative and collaborative nature of the evaluation process which was limited in scope given that the project was a Pathway's grant.

First, it is unclear whether and how the youth that participated in the YDP and YDI programs were representative of the youth at each organization, although based on the available information, all of the youth in the YDP and YDI programs were given an opportunity to participate in the *STEM Pathways* project. As it was not feasible to examine this issue in depth as the project unfolded, it will be important for future versions of this project to document any selection criteria that the organizational staff, and the youth, use for participating in the *Pathways* activities and how this affects the number of youth ultimately reached and the extent to which these youth represent the population of youth served at each organization.

Similarly the *Pathway's* pilot was not set up to explore the youths' experiences in light of their involvement in different program types within YDI and YDP. For example, within YDI some activity sessions were held as part of the Gang Prevention and Intervention program and while others were held as part of the Amistad Youth Crisis Shelter. Moreover, within YDP, some sessions were held as part of the Day Reporting program while others were held as part of the Secure Lock-Up Facility. In future work, it will be important to more carefully document which activities are conducted with youth from different programs within each organization, and the influence this program type may have on their experience.

Second, an ongoing challenge that occurred in evaluating the sessions was that at least some participants within each YDP and YDI program participated in more than one *STEM Pathways* activity, such that a given YDI youth, for example, may have participated in an art activity as well as a role model activity. Because of the inconsistent nature of program participation, due to the legal system and transport availability, within both the YDI and YDP programs there were some repeat participants, but also many youth were new to *STEM Pathways* programs each session. With respect to those who attended more than one session, while the duration of the youth activities was fairly short, typically less than an hour or two in each case, the experience of completing one of the *STEM Pathway* activities may have influenced a given youth's experience of another activity, as well as their responses on the pre- and post-activity questionnaires. The *Pathway's* pilot was not set up to explore the added value of multiple versus stand-alone sessions but is a factor well worth exploring in future work.

Third, although the surveys were pilot tested and the youth indicated they generally understood the questions and were comfortable answering them in written form, incomplete surveys were encountered across the sessions for several reasons. First, completion was voluntary and the surveys were part of the regular educational activities being conducted during the sessions. Second, the project team member that administered the surveys did not consistently have the opportunity to remind youth of the importance of completing all of the questions, nor did s/he have time to look over the surveys for missed items. Third, the YDP youth occasionally had to leave an activity session to go to court and did not have an opportunity to complete post-survey questions.

These are all issues that would need to be addressed in implementing and evaluating future versions of the *STEM Pathways* project, appreciating that these are complications that come with programs engaging incarcerated youth in particular and that controlling these complications may limit external validity.

Findings

The evaluation findings are presented in 3 parts:

Part 1:Youth feedback on the STEM Pathways media activities: Part 1 of this report is divided into 3 sections. Section 1.1 presents an overview of the *STEM Pathways* project media activities. Section 1.2 provides demographic and background information about the YDP and YDI youth that participated in the media activities and completed surveys relating to their experience. Section 1.3 presents the youths' feedback on their experience participating in the media activities.

Part 2: Youth feedback on the STEM Pathways art activities: Part 2 of this report is divided into 4 sections. Section 2.1 presents an overview of the *STEM Pathways* project art activities. Section 2.2 provides demographic and background information about the YDP and YDI youth that participated in the art activities and completed surveys relating to their experience. Section 2.3 presents the youths' feedback on their experience participating in the art activities. Section 2.4 presents examples of the artwork created by the youth during the art activities. These drawings were not analyzed, given the scope of the *STEM Pathways* project.

Part 3: Youth and role model feedback on the STEM Pathways flash mentoring with role models activities: Part 3 of this report is divided into 4 sections. Section 3.1 presents an overview of the *STEM Pathways* flash mentoring with STEM role models activities. Section 3.2 provides demographic and background information about the YDP and YDI youth that participated in these activities and completed surveys relating to their experience. Section 3.3 presents the youths' feedback on their experience participating in the flash mentoring activity. Section 3.4 presents the role models' feedback on their experience participating in the activities with the youth.

Part 1: Youth feedback on the *STEM Pathways* media activities

Part 1 is divided into 3 sections. Section 1.1 presents an overview of the *STEM Pathways* media activities. Section 1.2 provides demographic and background information about the YDP and YDI youth that participated in the media activities and completed surveys relating to their experience. Section 1.3 presents the youths' feedback on their experience participating in the media activities.

1.1 Overview of media activities

The *STEM Pathways* media component comprised two types of activities: video creation and screenings, as outlined below.

Video creation

The *STEM Pathways* team worked with YDI to create youth-produced STEM-related videos, supplying YDI staff with video equipment and related software to create and edit videos. The youth, as part of YDI's Teatro Consejo and Amistad Youth Crisis Shelter programs, volunteered outside of regularly scheduled program time to be trained in digital video production, including shooting and lighting techniques with a digital camcorder (Canon Vixia HF G20). The youth then learned file transfer and editing techniques with a variety of Mac and Windows software, including Final Cut, iMovie, and Adobe Premier, and were also introduced to graphic design with Adobe Photoshop. At the end of the project the youths' videos were screened in a public theater for their friends and family, followed by an awards ceremony with prizes in a variety of categories.[1]

The project team's rationale for pursuing this set of activities with youth was based in part on HCN's track record of successfully using diverse communication platforms with Hispanic youth. In addition the team looked to research demonstrating the power of media and video production to engage youth, and findings that indicated that successful programs often culminate in a public performance or exhibition in an effort to build participants' self-esteem through public recognition (Fleitman, 2012; Ahn, 2011; Watkins, 2009; Ito, Horst, Bittanti, Boyd, Herr-Stephenson, Lange, Pascoe, and Robinson, 2008; Barker, 2009; Hahn, 2002a, 2002b).

To assess the youths' experience creating the videos, a follow-up online survey was administered to explore the following issues: why the youth chose to participate; how much they felt they learned about STEM and STEM jobs as a result of creating the videos and what they learned; whether and how they felt that their leadership and communication skills improved as a result of creating the videos; whether they were interested in making more STEM videos in the future and what they would do differently; how much they enjoyed the *STEM Pathways* program and what they found to be the most valuable part; whether they attended the video screening and awards ceremony and whether their family or friends attended; whether they shared their videos with others; how interested they were in STEM jobs before and after participating in the *STEM Pathways* program; and whether they would be interested in STEM-related programs in the future.

---

[1] Each youth team's presentation was subsequently uploaded to a Tumblr site http://pathwaystostem.tumblr.com/videos so that youth worldwide can view and add to the video collection. In addition, some youth participated in anonymous audio interviews that were later used in the production of broadcast-quality radio PSAs in Spanish. These 4 one-minute PSAs were designed to provide information and inspiration to Spanish-speaking parents about potential STEM career interest in their children. The PSA's subsequently aired on HCN's national radio network with 254 stations and 13 million listeners.

Video screenings

The *STEM Pathways* team, in conjunction with YDI's Gang Prevention and Intervention Program team, hosted a formal video screening at a public theater (Wool Warehouse), where youth invited families and friends to view their videos. Following the screening, there was an awards ceremony during which youth were presented with STEM-related prizes (technology, science kits, art supplies) according to their level of participation in creating the videos.

The youth-produced videos ranged in content from youth demonstrating learned video techniques (stop motion animation; green screens; speed manipulation) with math-related subtext, to youth interviewing a role model (firefighter) met during a *STEM Pathways* flash mentoring role model activity, to STEM raps, to collaborative short group videos. Most of the videos included music/beats that the youth made or produced. A "Viewer's Choice" award was given to one youth for creating the *Fight Fire with Fire* video. The screen shot to the right shows a post announcing his win on the YDI Facebook page. His video and others were also hosted on the project's related Tumblr site http://pathwaystostem.tumblr.com/videos where youth were encouraged to continue video production

The youth videos were later screened for two separate youth audiences at YDP where participants had no personal connections to youth media producers. In this case, the *STEM Pathways* team wanted to explore the use of media as a means of facilitating peer-to-peer learning and having youth inspire other youth toward STEM careers and STEM learning. Since the YDP youth surveyed did not have previous experience with *STEM Pathways* programming – meeting role models, doing art activities, or engaging in STEM discussions – the *STEM Pathways* team wanted to see if the media component on its own had the potential to inspire youth toward STEM interest, potentially reducing the overhead of facilitating direct youth-to-role model activities.
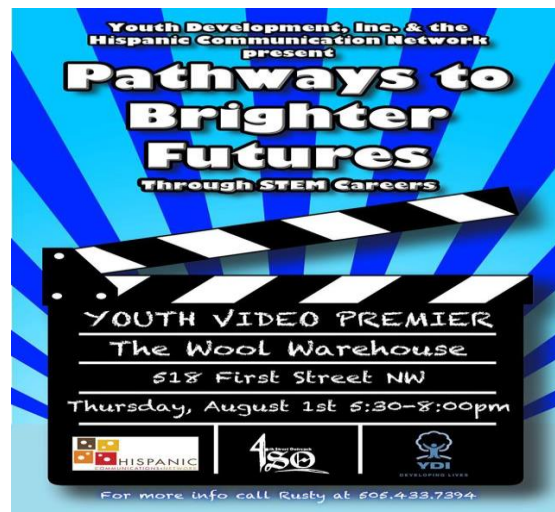
1.2 Background of youth participants

A total of 37 youth attended a *STEM Pathways* video screening and provided feedback, including 27 youth who watched the videos at the YDI Wool Warehouse event on August 1, 2013 and 10 youth who subsequently watched the videos at YDP a week later. There was an important distinction between the two types of screenings. The YDI Wool Warehouse screening was a community event such that the youth who produced the videos invited friends and families, and the tone was social and celebratory. The YDP screenings, meanwhile, were organized as regular activity sessions and held at YDP.

The youths' level of experience with the *STEM Pathway's* project also differed; while the YDI youth who attended the Wool Warehouse screening had participated in at least one media, art, and/or flash mentoring activity, the YDP youth did not have prior experience with any *STEM Pathways* activities.

Additional background information about the YDP and YDI youth that participated in the video screenings is provided below.

1.2a Background of YDP Youth

As stated above, the 10 youth that attended the video screenings at YDP and provided feedback had not previously participated in *STEM Pathways* activities. To give the project team a better understanding of the youths' background, the youth were asked to complete a short set of questions before watching the videos about their: demographic background, occupational status, interest in STEM jobs/careers, and media habits. A breakdown of their responses follows[2]:

- **Demographic background**: Most of the youth that attended the video screenings at YDP were male (80%) and of Hispanic origin (80%), while one youth indicated he was Native American or Alaskan Native and one did not specify his race. The youth ranged in age from 14 to 18, with the average age being 16.

- **Current occupational status**: Half (50%) of the YDP youth said they were looking for a job, while less than half (40%) said they currently held a job. All but one youth (90%) also categorized themselves as students. None of the youth said they were parents.

- **Jobs/careers to which the youth aspired**: When asked to identify the future job/career that they were most interested in pursuing, the YDP youths' top choices were: the military, sports (football or soccer), or auto body repair, each mentioned by one-fifth (20%) of the group. Other jobs/careers mentioned by individual youth included: *vet, magician, police officer, aerosol artist, dog trainer,* or *DJ-technical engineer-business.* When asked if they already knew someone in the profession they chose for themselves, nearly three-quarters (70%) of the youth confirmed they did, and pointed to a specific friend or relative (cousin, uncle, or grandparent), or to an older role model.

- **Amount and type of preparation required for youths' aspired jobs/careers:** All of the YDP youth estimated that the job/career they aspired to would require *a moderate amount* (60%) or *a lot* (40%) of preparation. When asked to describe the type of preparation they would need, nearly three-quarters (70%)

---

[2] Percentages are used in this section to stay consistent with the presentation of findings in section 1.2b, but note the lower number of respondents in this case (n=10).

said they would need some type of additional schooling; nearly one-third (30%) of these youth specified college.

- **Interest in STEM jobs**: Prior to the screenings half (50%) of the YDP youth said they had *little* to *no interest* in finding out about different job opportunities in STEM, while the remaining youth were *somewhat* to *moderately interested* (30%) or *very interested* (10%).[3]

- **Whether a science job/career was a possibility for them**: When asked whether they felt that working in a science job/career was a possibility for them in the future, nearly three-quarters (70%) of the YDP youth said *no* and went on to explain they disliked science, as in *I don't like science* or *science=don't get along.* A few youth (20%) who could see this as a possibility explained that they were *good with technology* or were *really looking forward to working with animals.* Finally, 1 youth (10%) indicated being uncertain whether a science job/career was a possibility, and went on to explain that he *would probably blow stuff up.*

- **What youth considered to be a science job**: When asked to give an example of a science job, the YDP youth most often mentioned the word *technology* (30%), followed by *experimenting* (20%) or *electronics* (20%). Other examples provided by individual youth were *forensic scientist,* a j*ob that is scientific in nature,* or *labs*.

- **Media habits**: Most of the youth said they both owned a cell phone with a camera and Internet (70%) and had access to the Internet at home (70%). Most also reported daily use of Facebook (80%) and YouTube (60%), while relatively few indicated that they used Tumblr (20%) or Twitter (10%).[4]

- **Video creation and sharing**: Half (50%) of the youth said they had previously made at least 1 video to share on the Internet, with nearly one-third (30%) of these youth specifying they had done so at least 2-3 times.

1.2b Background of YDI Youth

Unlike the youth from YDP, most of the 27 youth who attended the video screening and provided feedback at the YDI Wool Warehouse event had prior involvement with the *STEM Pathways* project. Nearly three-quarters (70%) had participated in a previous role model or art activity. Given these youths' prior experience and the time constraints involved in administering surveys at the Wool Warehouse event, the YDI youth only completed a post-viewing survey, rather than both a pre-viewing and post-viewing survey as occurred at the YDP session. The YDI post-viewing survey gathered limited background information relating to: basic demographic information, current occupational status, involvement in creating the videos shown at the screening, and method of learning about the screening. A breakdown of the youths' responses follows:

- **Demographic background**: The YDI youth ranged in age from 13 to 25 with the average age being 15. The majority of youth were of Hispanic origin (59%), with other youth reporting they were African-American (15%), White (11%), Native Hawaiian or Pacific Islander (11%), and Native American or Alaskan Native (4%). Nearly two-thirds of the youth were male (59%), one-quarter were female (26%), and the remaining youth (15%) did not report a gender.

---

[3] Note that these youth had not previously engaged in art or role model activities with the *STEM Pathways* team.
[4] In reflecting on these media use numbers the project team reflected that the YDP participants did not have access to phones or the Internet when incarcerated and that it was unclear whether the youth were answering these questions based on the assumption of their being "in" or "out" of the facility. If youth assumed they were being asked about media usage while incarcerated, the project team expected their frequency of usage would be significantly reduced or eliminated.

- **Current occupational status**: Few YDI youth said they currently had a job (7%) or were unemployed (11%). More than half (56%) said they were students and the remaining youth left the question blank or indicated 'other' but didn't elaborate (26%). None of the youth said they were parents.

- **Participation in video creation**: Two-fifths (41%) of the youth said they were involved in helping to create one or more of the videos that were shown at the screening.

- **How learned of Wool Warehouse event:** The majority of the youth said they heard about the Wool Warehouse event from YDI or another youth organization (59%), or from a friend (19%). Other youth said they heard about the event from Facebook (4%), a flyer (4%), or left the question blank (14%).

1.3 Youth feedback on the screening videos

After each video screening, the YDP and YDI youth were invited to complete a series of questions about the youth-produced videos they watched. Youth were asked to describe what they liked and didn't like about the videos, what they learned, and how much they felt they learned about STEM, STEM jobs/careers, and about the education, training, or skills needed to obtain a STEM job/career. The youth were also asked to consider: whether the videos caused them to think or feel differently about math or science; whether they planned to share the videos with friends or family; and whether they felt the videos would inspire their peers to learn more about STEM or STEM jobs/careers. The youth were additionally asked where they would prefer seeing similar videos in the future, and how interested they were in visiting the Tumblr *Pathways to Brighter Futures* site, which hosts all the screened videos. Finally, the youth were asked to indicate their interest in seeing more videos that feature youth interviewing STEM role models, and their recommendations for future videos about STEM or STEM careers. A breakdown of the youths' feedback is provided below:

- **What youth most liked about the videos**: Most often the YDP youth said they enjoyed the fact that the videos were made by or involved teens (50%) or incorporated rap (30%). Other YDP youth pointed to liking a specific video, including one that featured a youth interviewing a fireman (10%) or another that showed how to make a cheesecake and using math in the process (10%). Some YDI youth similarly indicated that they enjoyed the use of rap (15%) or the videos' use of teens (11%) but more often said they enjoyed that the videos were *exciting* or *cool* to watch (26%) or that they liked all of the videos or the videos in general (22%). A few YDI youth said they liked the videos' use of STEM (7%), interviews (7%), and/or music (7%).

- **What youth didn't like about the videos**: Two-fifth (40%) of the YDP youth and three-quarters (74%) of the YDI youth said there was nothing they disliked about the videos. The main complaints among the YDP youth were that the videos were at times *slow* or *boring* (30%) or had *poor sound quality* (20%). While there were no common themes among the responses of the YDI youth, individual youth pointed to the following issues: poor sound quality, a technical error, or something they didn't like about a particular actor in a video.

- **How much youth felt they learned about STEM or STEM jobs/careers:** Youth were asked to estimate how much they learned about STEM or STEM jobs/careers as a result of watching the videos. Nearly three-quarters (70%) of the YDP youth and nearly two-thirds (59%) of the YDI youth indicated they learned a *moderate* amount or *a lot*. The remaining youth in each group indicated they learned *little* to *nothing* (30% YDP, 41% YDI).

- **What youth felt they learned about STEM or STEM jobs/careers:** Among the YDP youth, while one-fifth (20%) indicated they learned *nothing* about STEM or STEM jobs/careers, most youth (80%) pointed to

something new that they learned. The YDP youth each pointed to something different, including: firefighting equipment, video making, the importance of technology, STEM jobs being interesting, and how to make cheesecake, which was demonstrated in one of the videos.

Among the YDI youth, about one-tenth (11%) said they didn't know if they learned anything new from the videos about STEM or STEM jobs/careers, while the remaining youth (89%) pointed to learning some new. Most often these youth pointed to learning about 1 of 3 topics: firefighting (22%), which was the focus of 1 video that featured a youth interviewing a fireman; how STEM jobs/careers use or involve STEM (18%); or the financial rewards of working in STEM (15%), summarized by 1 youth as *the amount of money you can make.* A few youth (7%) more generally indicated they learned *a lot* or *everything.* Other topics mentioned by individual youth included: *What STEM stands for, the fact that STEM takes work,* and *that STEM can involve art.*

- **How much youth felt they learned about the education, training, or skills needed to get a STEM job/career:** More than two-thirds of the YDP youth (70%) and YDI youth (67%) indicated they learned *a lot* or a *moderate* amount about the education, training, or skills needed to get a STEM or STEM job/career. Relatively few youth in each group (30% YDP, 33% YDI) indicated they learned *little* to *nothing*.

- **Whether youth felt the videos caused them to think or feel differently about science or math:**
Among the YDP youth, nearly two-thirds (60%) felt the videos caused them to think or feel about science or math in a new or different way. These youth tended to reflect that the videos portrayed STEM as being more *fun* or *interesting* than they realized or that STEM jobs/careers *paid more* than they thought. Meanwhile, not quite one-third (30%) of the YDP youth reported that the videos did not cause them to think or feel differently. Their reasons included: not liking science or math, perceiving that these subjects are *boring*, or not seeing STEM addressed in the videos, as 1 youth observed *I don't feel they were about science or math*. The remaining youth (10%) indicated uncertainty about the videos' impact but didn't elaborate.

Among the YDI youth, nearly half (44%) felt the videos caused them to think or feel about science or math in a new or different way. These youth most often pointed to the videos being *interesting* or *cool*, portraying *good jobs*, or showing how everything involves science or math, as in: *Cooking involves math and science as a matter of fact everything involves math-science, art and engineering.* One-third (30%) of the youth, however, felt the videos did not cause them to think or feel differently about science or math. As with the YDP youth, the YDI youth most often explained *I'm not really into math or science* or observed that they didn't see science or math depicted in the videos, as in *I didn't see any science.* A smaller group of YDI youth (15%) indicated they weren't sure, noting that they were either already aware of STEM opportunities or didn't know if a STEM career was for them. A few youth (11%) left the question blank.

- **Whether youth planned to share the videos with friends or family***:* Using a scale from 1 (strongly disagree) to 5 (strongly agree), youth in both groups tended to be neutral about whether they would share the videos with their friends or family members. Whether referring to friends or family members, the median ratings in each case were 3.5 (YDP) and 3.0 (YDI). The ratings ranged from a low of 2 to 5 within YDP and 1 to 5 within YDI, however, indicating there were some differences in opinion within each group.

- **Whether youth felt the videos could inspire other youth to learn more about STEM or STEM jobs/careers**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), youth within YDP tended to agree (median rating 4) that the videos shown at the screening, or similar videos, could inspire their friends to learn more about STEM or STEM jobs/careers. Meanwhile, youth within YDI tended to be neutral (median

rating 3) about this issue.[5] The ratings ranged from 2 to 5 within YDP and 1 to 5 within YDI, however, indicating there were some differences of opinion within each group.

- **Interest in making videos like those viewed:** YDP youth tended to strongly agree that they would like to make videos like those they watched at the screening (median rating 5) while YDI youth tended to be neutral about this idea (median rating 3). The ratings ranged from 2 to 5 within YDP and 1 to 5 within YDI, indicating there were some differences of opinion within each group.

- **Interest in watching the same videos again**: Youth in both groups tended to be neutral about whether they would like to see the same videos they watched at the screening again. The median rating in both groups was 3.0, although the ratings ranged from 2 to 5 in the YDP group and 1 to 5 in the YDI group, indicating there were some differences of opinion within each group.

- **Interest in watching more videos like the ones just viewed:** Youth in both groups tended to agree that they would like to watch more videos like the ones they viewed at the screening. Using a scale from 1 (strongly disagree) to 5 (strongly agree), the median rating in both groups was 4. The ratings ranged from 3 to 5 within YDP and 1 to 5 within YDI, however, indicating some differences of opinion within each group.

- **Interest in seeing more videos that feature youth interviewing STEM role models**: Half (50%) of the YDP youth and almost half (48%) the YDI youth reported they were interested in seeing more videos that show youth interviewing STEM role models in the future. YDP youth most often explained that these videos were *interesting, cool*, or informed them *about different jobs*. YDI youth pointed to similar reasons, although individual youth observed that they: enjoyed watching other youth, felt the process of interviewing was empowering to youth, and/or that they would enjoy being inspired by role models. As 1 youth summed it up: *It would be fun to make and I would love to be inspired and watch others be inspired by that.*

  Meanwhile, one-tenth (10%) of the YDP youth and one-quarter (26%) of the YDI youth indicated they were not interested in seeing more videos featuring youth interviewing STEM role models. The YDI youth explained that the videos were *boring,* or that they *saw a lot of role models*, likely referencing back to their involvement with STEM role models in prior Pathways role model activities. The YDP youth, who didn't have this experience, instead observed that, *Those ain't the kind of jobs I want!* Finally, two-fifths (40%) of the YDP youth indicated they weren't sure if they were interested, with 2 youth elaborating that they didn't *understand the point* or see STEM represented, as in *If it was I didn't recognize it.* Meanwhile, one-quarter of the YDI youth either said they weren't sure and elaborated *I don't know* (4%), or left the question blank (22%).

- **Recommendations for future videos about STEM or STEM careers**: When asked to reflect on the videos they watched and then suggest other ways that videos could show youth information about STEM or STEM jobs/careers, the youths' individual recommendations included: *question more role models*; *examples of people who failed in succeeding and those who did the better life yours to choose; more rapping*; *dancing, no drugs, just say yes[6]; more ideas more videos more people involved; more people; I want to be part of the videos*; and *featuring activities that people our age do like skateboard, Art ("Graffiti"), sports, music.*

- **Where youth would prefer seeing similar videos in the future**: Youth were asked "If you had an opportunity to watch more videos like you saw today, where would you want to want to watch them?" The

---

[5] The project team attributed this to viewers' relationship with the video producers at YDI.
[6] According to the project team, this youth was referring to a specific video that prompted youth to "Just Say Yes" to STEM.

youth were then given a variety of response options and an 'other' option and asked to check all that applied. Youth in both groups most often pointed to YouTube (50% YDP, 63% YDI), followed by their own youth organization (50% YDP, 37% YDI), or Facebook (30% YDP, 37% YDI). The youth in both groups indicated less interest in watching the videos at a friend's house (1% YDP, 15% YDI) or on Tumblr (0% YDP, 7% YDI). There was one apparent difference between the two groups' preferences: where nearly three-quarters (70%) of YDP youth indicated interest in watching the videos at school, only one-quarter (26%) of YDI youth pointed to this option. Other options given by individual youth were home (YDP) or Google (YDI).

- **Interest in Tumblr *Pathways to Brighter Futures* site:** Finally, YDI youth were also asked to indicate their level of interest in visiting the Tumblr *Pathways to Brighter Futures* site that was discussed at the video screening. One-quarter (25%) responded that they were *very interested* in checking out the site, while one-fifth each said they were *moderately* (19%), *somewhat* (19%) or *slightly* (22%) interested. The youths' main reasons for not having an interest in visiting the site were because they didn't like or didn't use Tumblr. The remaining youth (15%) left the question blank.

1.4 Youth feedback on creating the videos

Among the YDI youth, approximately 8 of the 27 youth (30%) were regularly involved in creating the youth-produced videos. To assess these youths' experiences, a follow-up online survey was administered to explore the following issues: why the youth chose to participate; how much they felt they learned about STEM and STEM jobs as a result of creating the videos and what they learned; whether and how they felt that their leadership and communication skills improved as a result of creating the videos; whether they were interested in making more STEM videos in the future and what they would do differently; whether they attended the video screening and awards ceremony and whether their family or friends attended; whether they shared their videos with others; how much they enjoyed the *STEM Pathways* program and what they found to be the most valuable part; how interested they were in STEM jobs before and after participating in the *STEM Pathways* program, and whether they would be interested in more STEM-related programs in the future.

Just over half (5) of the youth who participated in the video production activities provided feedback. While the follow-up survey did not ask for demographic information, project records indicated that in this case all of the respondents were male. Their reflections are summarized below.[7]

- **How much youth learned about STEM jobs as a result of creating the videos:** On a scale of 1 (learned nothing) to 5 (learned a lot), all of the youth indicated that they learned *a lot* (n=4) *or a moderate amount* (n=1) about STEM jobs. None of the youth indicated they *learned a little* or *learned nothing*.

- **How much youth learned about STEM in general as a result of creating the videos:** A couple of the youth indicated that they learned *a lot* about STEM, while a couple indicated that they learned *a moderate amount*, and the remaining youth indicated that he learned *a little*. None of the youth reported *learned nothing*.

- **What youth learned about STEM jobs or STEM as a result of creating the videos:** A few youth (3) wrote about STEM careers providing *good money*, with one youth further elaborating on how people with STEM jobs also *help the environment*. Individual youth reported learning about the importance of technology in their lives or that STEM stands for science, technology, engineering, and math.

---

[7] Given the small number of youth providing feedback in this standalone section, the findings in this section are presented as simple counts.

- **How much the youths' leadership and communication skills improved as a result of creating the videos:** When asked to identify the areas in which they felt their skills had improved, all but one youth indicated that their video skills had improved, and three each indicated that they were better at: filming, communicating their ideas, and working with others. A couple of youth indicated that their research skills had improved, and one each indicated that he was better at interviewing, directing, writing, and conducting experiments. None of the youth indicated that creating the videos had helped improve their ability to take initiative. When given the opportunity to explain their selections, a couple of youth declined to provide additional information, while one youth noted that he learned about the value of using multiple sources when researching, 1 commented on the importance of collaboration when working on a group project, and another reiterated his enjoyment of the filming process.

- **Why youth wanted to participate in the *STEM Pathways* project:** A couple of the young men said that they participate in the project to learn more about career options they could aspire to (for example, it *[tells] young kids that they could do anything they set their minds to and become anything in life*), while a couple commented on a personal interest in the topics of the videos or project (for example, *all the cool ideas that we had made up to do for the project*), and one youth indicated that it seemed like it would be *a lot of fun* and that he was interested in the reward he would receive for his involvement.

- **Are the youth interested in making more STEM videos in the future:** All of the participating youth said they would be interested in making more STEM videos in the future. When asked to elaborate, a couple of the youth commented on an interest in video production, as in *[making videos is] a lot of fun* and *I want to participate more on the video filming*. One youth commented on the value of interviewing role models to learn about *future careers*, while another indicated that he enjoyed *learning about how technology works*, and yet another said he would consider making another STEM video *depending on the idea* for the project.

- **What the youth would do differently if they were to create another STEM video:** All of the youth suggested ways to improve on their video productions. A couple of the youth said they would make a better video, with one youth elaborating that the video would be similar to his first film but *a little more planned out*. Individual youth suggested that they would do *more music*, provide *more information about the career and role model*, or divide the teams into *different groups* to look at *different [STEM] subjects*.

- **Reflections on the Wool Warehouse screening:** All of the participating youth indicated that they attended the screening event on August 1, 2013. When asked how much they enjoyed participating in the event, all but one indicated that they *totally enjoyed* the experience and one youth indicated that he *very much enjoyed* the experience. No one indicated that they *moderately enjoyed*, *somewhat enjoyed*, or *did not enjoy* participating in the event.

- **Screening attendance and sharing of videos with family and friends:** When the youth were asked if their friends and family attended the event, one youth indicated that both his friends and family members attended, while a few youth indicated that just their friends attended, and one youth indicated that his family members attended but his friends did not. When asked if they had shared the video(s) with friends, family, or classmates, a couple of youth indicated that they had shown the video(s) to family members, while the remaining individual youth respectively indicated that they had shown the video(s) to family and friends, only to friends, or only to classmates.

- **Reflections on the *STEM Pathways* program in general:** When asked how much they enjoyed participating in the *STEM Pathways* program, a couple of youth indicated that they *totally enjoyed* the experience, while a

couple of others *moderately enjoyed* it and one youth *very much enjoyed* the experience. None of the youth said they *somewhat enjoyed* or *did not enjoy* the experience.

- **The most valuable part of the *STEM Pathways* program:** A few of the youth indicated that *meeting the role models* and learning about their work/career was the most valuable part of the *STEM Pathways* program. One youth indicated that he most valued working with *the video equipment and all of my peers*, while another said that he most valued learning *how to ask more questions*.

- **Youth interest in STEM jobs before and after the *STEM Pathways* program:** On a scale of 1 (not at all interested) to 5 (very interested), the youth indicated they were generally *not interested* in STEM jobs <u>before</u> the *STEM Pathways* program, with the median being 1, although and the youths' individual ratings ranged from a low of 1 to a high of 4, indicating there were some differences of opinion within the group.

  <u>After</u> the *STEM Pathways* program, the youth indicated they were *somewhat interested* in STEM jobs, with the median being 3 and the youths' answers ranging from a low of 2 to a high of 5. All of the youth indicated that they would also be interested in learning more about STEM-related programs in the future. When asked to elaborate, they gave a range of reasons, ranging from career development (*it helps youth to choose their careers*) to personal interest and enjoyment (*it was entertaining* and it's *fun to work with STEM*).

Part 2: Youth feedback on the *STEM Pathways* art activities

Part 2 of this report is divided into 4 sections. Section 2.1 presents an overview of the *STEM Pathways* art activities. Section 2.2 provides demographic and background information about the YDP and YDI youth that participated in the art activities and completed surveys relating to their experience. Section 2.3 presents the youths' feedback on their experience participating in the art activities. Section 2.4 presents examples of the artwork created by the youth during the art activities.

2.1 Overview of art activities

During initial listening sessions with youth at YDI, YDP, and youth mentors at ¡YouthWorks! (YW)[8], the *STEM Pathways* team found participants to be generally interested, but not necessarily participative and team members sensed some mistrust from youth. In order to help build trust, develop language to inform the project, recruit relevant and interesting role models, and most importantly, prepare youth and get them thinking about their futures and STEM careers, the team decided to explore the use of art activities.

The *STEM Pathways* team members possessed backgrounds in art education and art therapy, both of which were helpful in designing language and framework for art activities. The team also drew on youth development research showing that art activities are especially helpful as part of first time encounters with youth. Art activities have been shown to engage the entire group, build trust, facilitate open discussion, and can be an effective vehicle to engage youth in activities that will increase their self-esteem (Gittleman, 2007; National Endowment for the Arts, 2002; Deasy, 2002). In comparing arts programs with other types of afterschool program activities, researchers have found that certain aspects of experience and interaction at youth-based arts organizations intensify the characteristics of effective learning environments (Heath, 2012; Heath and Roach, 1999; Heath and Smyth, 1999; Heath and Soep, 1998). Researchers have further found that the arts call for the youth to take greater risks, which include the risk in trying new methods and approaches and the risk of possible ridicule for being engaged.

---

[8] See page 7 for additional information about YouthWorks and its role in the *STEMS Pathways* project.

During the art activity sessions, which on average ran approximately 30 to 45 minutes, the *STEM Pathways* team gave participants a variety of art materials including pencils, pens, markers, colored pencils, oil pastels, magazine clippings, glue, glitter, and large pieces of paper. Depending on the specific activity, participants were given one or multiple directive(s) or question(s) to focus on in their art. The intention was to create a space free for creative expression, and participants were given few restrictions on their art focus, including being allowed to "tag" (aka graffiti-style writing) when otherwise prohibited at all facilities. The most frequent directions used in the sessions included:

- Create an image about where you imagine yourself to be realistically in (five) ten years (could be an image about family life, work life, social life, spiritual life, etc.).

- Create another image of your highest hope for yourself doing what you love in your dream life and career. Your highest hope, something you want for yourself. If your wish could come true, where would you see yourself in 5 years. The sky's the limit.

- Consider the two images together. What's different about the two? What is constant or repeated in the two? What might be needed to link the two closer together, to bridge the gap between them? What obstacle is standing in the way of reaching your hope for yourself? Or what would you need that would be the bridge or the link between the two pictures? This could be a symbol, a new perspective, a particular set of concrete actions, a miracle, help from a family member, etc.

In total six directed art activities were conducted, three at YDP and three at YDI.[9] The evaluation findings that follow are based on the feedback from a total of 29 youth who completed 1 art activity session at either YDP (20) or YDI (9).[10]

2.2 Background of youth participants

2.2a Background of YDP Youth

To give the project team a better understanding of the youths' background, the 20 YDP youth that participated in an art activity were first asked to complete a short set of questions in a pre-activity survey, focusing on their: demographic background, occupational status, interest in STEM jobs/careers, and media habits. A breakdown of their responses follows:

- **Demographic background**: Most of the YDP youth that attended the art activity were male (70%). The youth ranged in age from 14 to 18, with the average age being 16. Youth in this session were not asked for their racial/ethnic background but attendance sheets for the session indicated that the youth were primarily Hispanic.

---

[9] Within YDI, 2 sessions were held as part of the YDI's Gang Prevention and Intervention program and 1 was held as part of the YDI's Amistad Youth Crisis Shelter. Within YDP (incarcerated youth), 2 sessions were held as part of the Day Reporting program and 1 was held as part of the Secure Lock-Up Facility.

[10] According to the project team, the YDI art activity for which there is survey data was not the same art activity completed by the YDP youth. The YDP activity focused on youth envisioning a future for themselves, an ideal future career, and the bridge between the two. The YDI youth meanwhile, were given the following questions to consider in creating art to display at the Wool Warehouse video screening event: 1) Why is a STEM job a good job? 2) How does STEM relate to you or your future career? And 3) What's cool about STEM? The latter activity was done at the end of the project timeline, while the former activity was done during initial project time.

- **Current occupational status**: Nearly half (45%) of the YDP youth said they were looking for a job, while one-fifth (20%) said they currently held a job. Three-quarters (75%) of the youth categorized themselves as students. One-fifth (20%) said they were parents.

- **Jobs/careers to which the youth aspired**: When asked to identify the future job/career that they were most interested in pursuing, the YDP youths' top choices were: the military, sports (e.g. football or basketball), and auto repair, each mentioned by one-fifth (20%) of the group. Other jobs mentioned by somewhat smaller groups were: having a business (15%), construction (10%), and hair styling (10%). When asked if they already knew someone in the profession they chose for themselves, two-fifths (40%) of the youth confirmed they did, and all but one pointed to a relative (parent, cousin, uncle, or grandparent), with one youth pointing to a friend.

- **Amount and type of preparation required for these jobs/careers:** Most of the YDP youth estimated that the job/career they aspired to would require *a lot* (70%) of preparation with the remaining youth pointing to *a moderate amount* (20%) or *a little* (10%). When asked to describe the type of preparation they would need, three-quarters (75%) of the youth said they would need some type of additional schooling, with two-thirds (65%) specifying college.

- **Interest in STEM jobs**: Prior to participating in the art activity, relatively few YDP youth (15%) said they had *little* to *no interest* in finding out about different job opportunities in STEM, while the remaining youth were *somewhat* (30%), *moderately* (35%) or *very interested* (20%).[11]

- **Whether a science job/career was a possibility for them**: When asked whether they felt that working in a science job/career was a possibility for them in the future, two-fifths (40%) of the YDP youth said *yes* and went on to explain: *I am good at science, you make great amount of money, I am smart and I believe we need more scientists,* or *anything is possible.* The remaining youth were divided between *no* (30%) and *not sure* (30%) and went on to explain they disliked science as in *I don't like science that much,* or had other plans as in *I have future plans already*. A couple of youth indicated they weren't sure and offered other reasons including *I'm not that smart* and *not sure because I from Mexico* and *I don't have papers.*

- **What youth considered to be a science job**: When asked to give an example of a science job, one-fifth (20%) of the YDP youth said *scientist,* with other individual youth saying *studying planets, chemicals, engineer, or studying minerals,* or *don't know*. The remaining youth provided some other unrelated answer or left the question blank.

- **Media habits**: The majority of the youth said they both owned a cell phone with a camera and Internet access (65%) and/or had access to the Internet at home (65%). Half (50%) of the youth reported daily use of Facebook (50%) and one-quarter reported daily use of YouTube (25%); only a small percentage of youth (15%) indicated they never went to Facebook while a large percentage (65%) indicated they never went to YouTube. Most of the youth said they never used Twitter (70%), Instagram (70%), or Tumblr (75%). Other social media sites that individual youth reported using at least occasionally were Google and Pandora.[12]

---

[11] The *STEM Pathways* team noted that it opened the activity sessions with an introduction to STEM jobs, pointing to the fact that these jobs pay almost twice as much hourly in NM than non-STEM jobs.

[12] In reflecting on these media use numbers the project team qualified that participants from YDP did not have access to phones or Internet when incarcerated and that it was unclear whether the youth were answering these questions based on the assumption of their being in or out of the facility. If youth assumed they were being asked about media usage while incarcerated, the project team expected their frequency of usage would be significantly reduced or eliminated.

- **Video creation and sharing**: Not quite half (45%) of the youth said they had previously made at least 1 video to share on the Internet, with nearly one-fifth (20%) of these youth specifying they had done so at least 2-3 times.

2.2b Background of YDI Youth

As with the YDP youth, the 9[13] YDI youth that attended the art activity and provided feedback completed a pre-activity survey to give the project team a better understanding of their backgrounds. The youth were asked a short set of questions focusing on their: demographic background, occupational status, interest in STEM jobs/careers, and experience in creating and sharing videos. A breakdown of their responses follows:

- **Demographic background**: All but one YDI youth was male (90%). The youth ranged in age from 13 to 24 with the average age being 16. Youth in this session were not asked for their racial/ethnic background but attendance sheets for the session indicated that the youth were primarily Hispanic.

- **Current occupational status**: About one-fifth (22%) of the YDI youth said they currently had a job and one-third (33%) said they were looking for a job. More than half (56%) said they were a student. None of the youth indicated they were parents.

- **Jobs/careers to which the youth aspired**: When asked to identify the future job/career that they were most interested in pursuing, the YDI youths' top 2 choices were the military and sports (football), each mentioned by one-fifth (20%) of the group. Other jobs mentioned by individual youth were *English teacher, businessman, lowriding, rapper/beat production, charge nurse,* and *someone successful*. When asked if they already knew someone in the profession they chose for themselves, more than three-quarters (78%) of the youth confirmed they did, all but one of whom pointed to a friend or relative (parent or uncle).

- **Amount and type of preparation required for these jobs/careers:** Most of the YDI youth estimated that the job/career they aspired to would require either *a moderate amount* (89%) or a *little* preparation (11%). When asked to describe the type of preparation they would need, all but one youth (89%) said they would need some type of additional schooling, with more than half (55%) specifying college.

- **Interest in STEM jobs**: Less than half of the YDI youth said they had *little* (22%) or *no interest* (22%) in finding out about different job opportunities in STEM, while more than half were *somewhat* (44%) or *moderately* (11%) interested. None were *very interested*.

- **Whether a science job/career was a possibility for them**: When asked whether they felt that working in a science job/career was a possibility for them in the future, none of the YDI youth said *yes*. The majority of youth said *no* (67%) and went on to explain they disliked science or weren't good at it or that they already had plans as in *I already know what I want to do with my future.* Not quite one-third (30%) said *not sure* and pointed to other interests or expressed uncertainty as in *Don't really know what I want to be yet.*

- **What youth considered to be a science job**: When asked to give an example of a science job, the two most common responses were labs, such as Sandia Labs (30%) and biologist (22%). Other responses by individual youth included astronomer, chemical weaponry making, biographer, money, body movement.

---

[13] Percentages are used in this section to stay consistent with the presentation of findings in section 2.2a, but note the lower number of respondents in this case (n=9).

- **Video creation and sharing**: More than two-thirds (66%) of the youth said they had previously made at least 1 video to share on the Internet, with one-third (33%) of these youth specifying they had done so at least 2-3 times.

2.3 Youth feedback on the art activity

After the art activity, the YDP and YDI youth completed a series of questions. The youth were asked to rate how much they liked the activity, to describe what they liked and did not like, and to describe anything they found confusing. YDP youth also were asked to answer questions about the discussion portion of the activity and to indicate their interest in doing more activities in the future. Their feedback helped inform the ongoing design of the art activities. A breakdown of the youths' responses follows:

- **How much youth liked the activity:** Using a scale from 1 (did not like) to 5 (totally liked) youth in both groups tended to indicate they *very much liked* doing the art activity. The median rating was 4 in both YDP and YDI groups, with the youths' individual ratings ranging from a low to 1 to a high of 5, indicating there were some differences of opinion within each group.

- **What youth most liked:** When asked to describe what they liked most about the art activity, more than two-thirds (67%) of the YDP youth liked the opportunity to look to the future, as in *I actually daydreamed about what I want to be,* or the activity of drawing or doing art, as in *Drawing, art.* One-third (33%) liked that the activity was fun or allowed for creative expression as in *I managed to express myself*. Other aspects liked by individual youth included *the money[14], the people (STEM Pathways project team) talking/encouraging me, what I like about the art was that their no wrong answers, see other peoples,* or *I don't know.* Nearly two-thirds (60%) of The YDI youth, meanwhile, most liked doing the art activity in general with other youth indicating they liked writing about what they liked (20%) or using the glitter (20%).

- **What youth least liked**: More than half (55%) the YDP youth said there was nothing they disliked about the art activity, although a few youth (15%) indicated they felt they had to rush or indicated they had difficulty figuring out what to draw, as in *It was hard for me to think about what to draw*. Other aspects that individual youth disliked included *The clapping thing* and *my handwriting, don't like art*. While two-fifths (40%) of the YDI youth said there was nothing they disliked, a small group (20%) indicated they didn't like the amount of talking, as *in I didn't like that there was a lot of talking involved*. Other aspects not liked by individual youth included the drawing, the writing, or the focus on STEM.

- **What youth found confusing**: When asked whether they found anything in the art activity confusing or hard to follow, nearly three-quarters (70%) of the YDP youth reported that nothing was confusing because *it was easy* or because *it was fun or cool*. Nearly one-third (30%) of the youth, meanwhile, pointed to one of two issues, either *I'm not that good at drawing* or *it's pretty hard to think about what draw*. Among the YDI youth, a small group (5%) indicated the activity was confusing because it was *difficult to understand*, while nearly half (45%) indicated the activity was *simple*, *easy to understand*, or that they *followed directions*. The remaining youth (50%) left the question blank.

- **How much youth liked the group discussions and felt comfortable discussing what they made:** The YDP youth were asked two additional questions about the supplemental discussion that followed

---

[14] The youth was referring to the statistic in the introduction/discussion about the earning potential among STEM jobs.

their art activity. Using a scale from 1 (did not like) to 5 (totally liked), these youth tended to *moderately like* the group discussion. While the median rating was 3 for the group, the individual ratings ranged from a low to 2 to a high of 5, indicating there were some differences of opinion within the group.

Similarly, using a scale from 1 (not comfortable) to 5 (totally comfortable) YDP youth tended to indicate they were *moderately comfortable* discussing what they made with the group, which included discussing their career goals. While the median rating was 3 for the group, the youths' ratings ranged from a low to 1 to a high of 5 indicating there were some differences of opinion within the group.

- **Whether youth were interested in doing more activities**: The YDP youth were also asked whether they were interested in doing more art activities. Most (85%) of these youth indicated they were interested in doing more art activities. Their reasons included that the experience was *fun* or *interesting* or because it enabled them to express themselves as in *to express myself more*. A small group of youth (15%), however, felt that they weren't interested in doing more activities because they found it *hard to draw,* felt they had *no imagination, or did not like art.*

2.4 Examples of youths' artwork

This section includes examples of drawings created by the youth participants at YDI during their respective art activity sessions. Examples of drawings from the YDP youth weren't available for use in the report.

The drawing above and to the left was created by a male youth in response to the prompt "*What is cool about STEM?"* The drawing on the right was created by a female youth in response to the prompt *"What do you like about STEM?*

The drawing below and to the left was created by a male youth, while the drawing to the right was created by a female. In both cases the prompts involved their expressing what they found cool about STEM or what they liked about STEM.
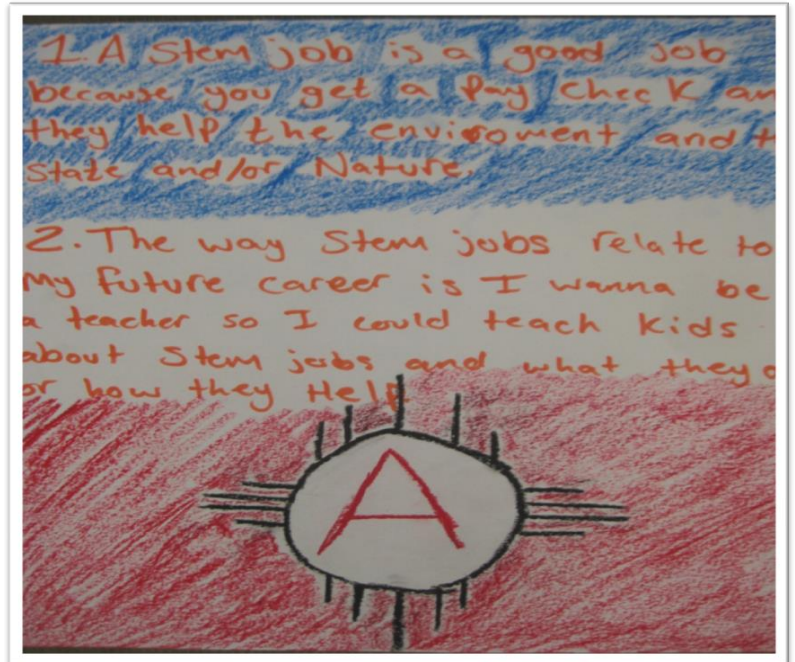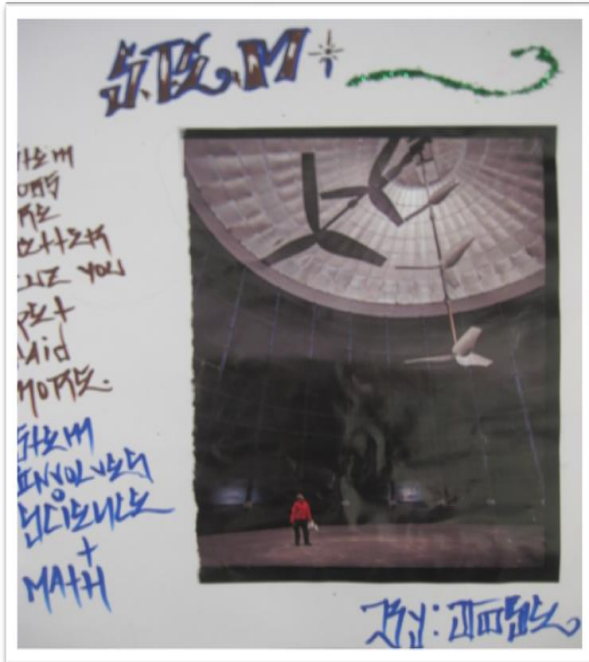
The drawing below was created by a male youth in response to the prompt *"What is cool about STEM?"*
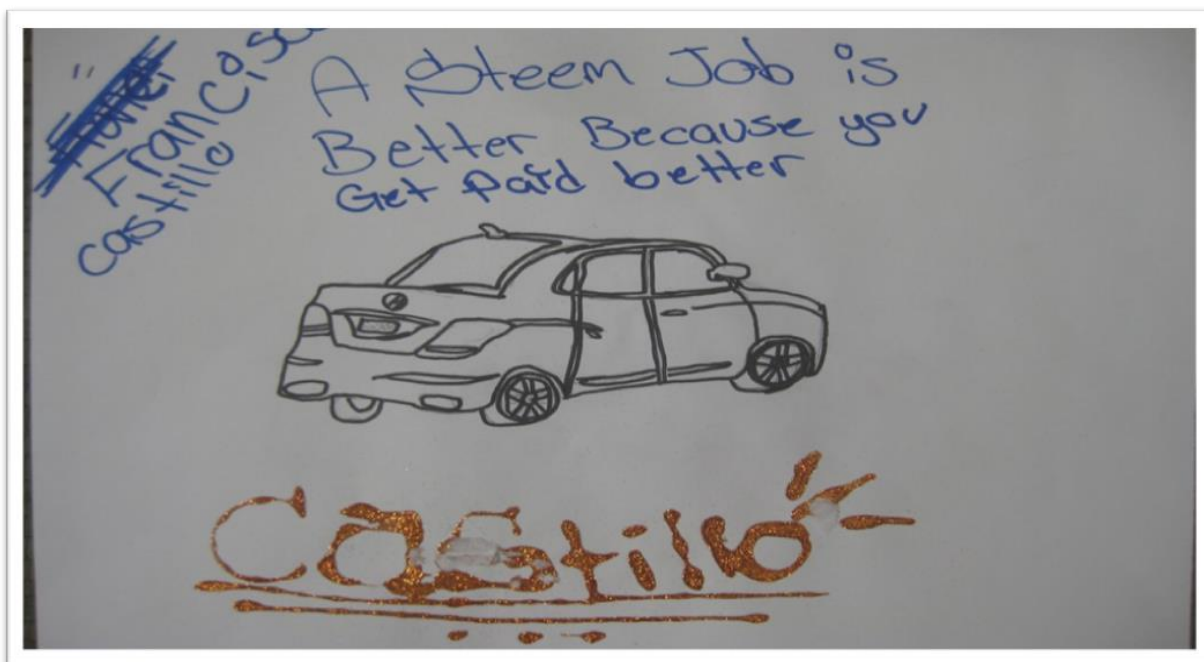
The two drawings below were created by male youth. Their prompts included what they found cool about STEM and what they liked about STEM.
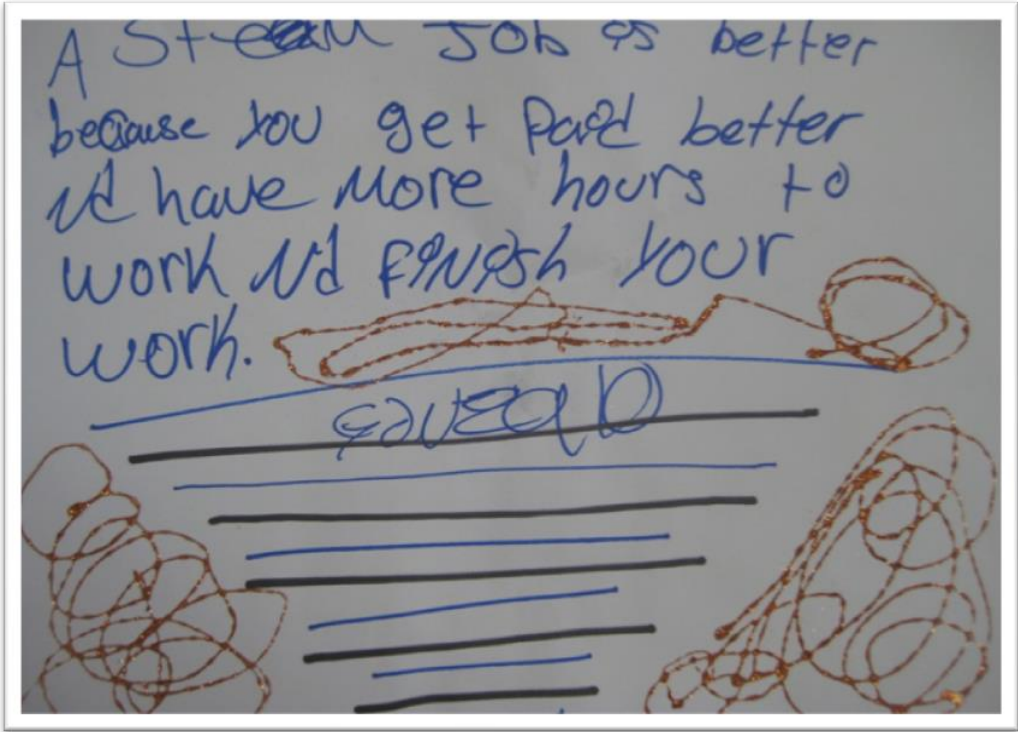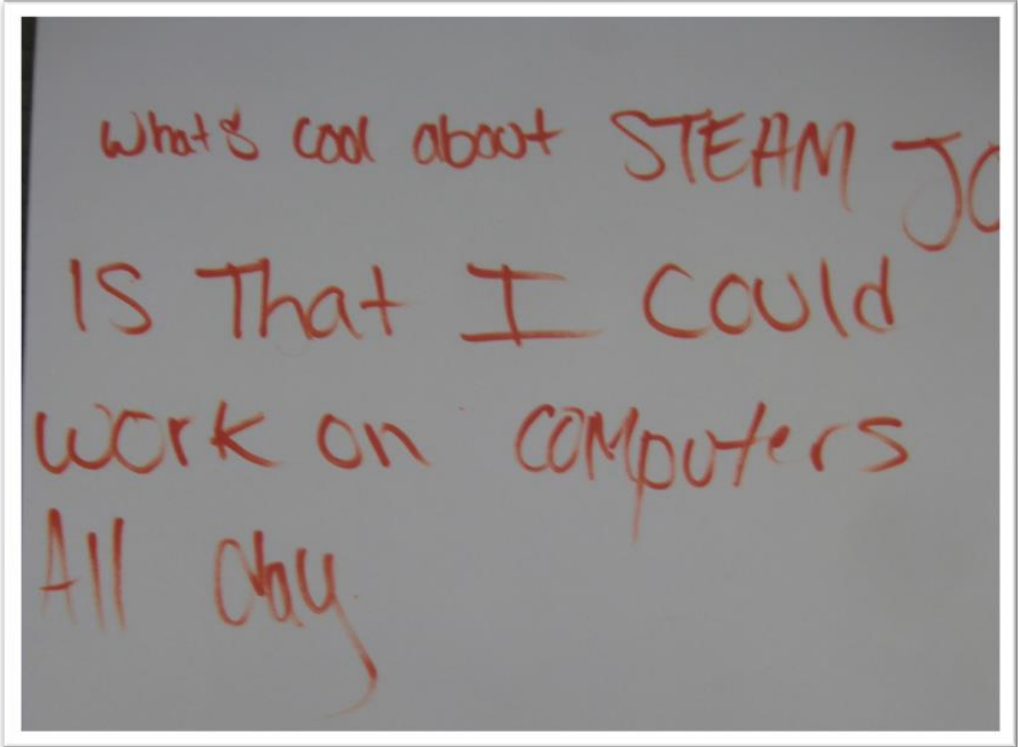
What's cool about STEAM JO[BS]
IS That I could
work on computers
All day.

A STeam Job is better
because you get paid better
it have more hours to
work it finish your
work.

Part 3: Youth and role model feedback on the *STEM Pathways* flash mentoring with role models activity

Part 3 of this report is divided into 4 sections. Section 3.1 presents an overview of the *STEM Pathways* flash mentoring activities. Section 3.2 provides demographic and background information about the YDP and YDI youth that participated in these activities and completed surveys relating to their experience. Section 3.3 presents the youths' feedback on their experiences participating in the flash mentoring activity. Section 3.4 presents the role models' feedback on their experiences participating in these activities with the youth.

3.1 Overview of flash mentoring with STEM role model activities

The *STEM Pathways* team aimed to connect YDP and YDI youth with STEM role models to learn about their professional and personal career trajectories in a familiar, comfortable atmosphere. This "role modeling" aspect of the project was based on research demonstrating that through informal opportunities to listen to the personal success stories of other Hispanics working in renewable energy and other STEM-related professions, Hispanic youth will both better grasp the application of scientific principles and be inspired to stay in school and pursue STEM education (Au, 1980; Davidson, 1999; Zacharia and Barton, 2003).

The flash mentoring activities generally consisted of the *STEM Pathways* team introducing STEM concepts and highlighting the potential for increased earnings in STEM-related jobs in New Mexico. The visiting role models then provided a short presentation that often included hands-on activities and interaction with STEM materials[15], during which youth engaged in icebreaker questions so that role models knew a little more about their career interests. Depending on the number of role models and youth present, youth met in small groups of 1-5 and sat with 1 role model at a time for flash mentoring sessions that lasted 8-14 minutes each. To facilitate the interviews, youth were provided with brief written biographies of role models and sometimes (after youth provided feedback to this point) sample questions to ask role models.

In addition to discussing STEM, role models were encouraged to discuss the social and financial rewards of their career choices and highlight the mathematics and science each needed to study for his/her chosen profession. They were also encouraged to discuss how they set their own goals and sought out the necessary training they needed despite any barriers they may have faced, such as language, lack of role models, or minimal financial resources. Meanwhile, youth were encouraged to "ask anything" and were told that no subject was off limits, an invitation with which the role models were asked endorsed beforehand. They were encouraged to probe the role models about their pathways to their careers and how they overcame challenges they faced along the way. Meanwhile, the *STEM Pathways* team created an informal environment, bringing pizza to share and asking the role models to dress casually.

In some cases the role model activities incorporated a media production element as youth videotaped role model interactions. One of these interviews, the *Fight Fire with Fire* video referenced earlier in this report, was later featured in the youth-produced videos screened at the Wool Warehouse event/awards ceremony. Each team's presentation was also uploaded to a Tumblr site so that other youth could continue to view and add comments.

---

[15] A STEM Discussion Guide and handouts with STEM opportunities and resources were created, as well as sample questions for youth to ask role models, serving as tools that could be used during the activity, as well as later, for inter-generational dialogue, as a "take-home."

Ultimately, the *STEM Pathways* team recruited 35 role models, the majority of whom were Hispanic. All were either scientists and engineers from Los Alamos and Sandia National Laboratories, engineers, entrepreneurs, technicians, web developers, or business owners from New Mexico's private sector alternative energy companies. Some of the role models, particularly those from the Labs, had prior experience serving as role models with STEM outreach projects, but most had never been in conversation with "at-risk" teens about their careers, nor been inside a youth prison. To address this issue, *STEM Pathways* project team worked with these role models prior to the sessions to help develop the necessary skills to be effective STEM communicators and to prepare content and tone for the youth activities.

The *STEM Pathways* project team conducted a total of 8 role model activities, 5 within YDP and 2 within YDI.[16] Other than 1 activity session at YDI that was 3 hours long and included an art activity, all role model activities were approximately 1.5 hours long. The agenda generally consisted of facilitation of the pre-activity survey, 15 minutes of intros/icebreakers with youth and role models in order to provide some background for conversation, 45-65 minutes of youth/role model discussion in small groups, and 15-20 minutes for debriefing, discussion, and administration of the post-activity survey.

A total of 71 youth attended *STEM Pathways* role model activity sessions, including 36 youth at YDP and 35 youth at YDI. The findings below are based on the feedback from more than two-thirds of this group (69%), which included 49 youth who completed 1 role model session at either YDP (26) or YDI (23) youth.

3.2 Background of youth participants

3.2a Background of YDP Youth

The 26 YDP youth who participated in a role model activity and provided feedback completed a pre-activity survey prior to the session to give the project team a better understanding of the youths' background. The youth were asked a short set of questions focusing on their: demographic background, occupational status, interest in STEM jobs/careers, and media habits. A brief overview of their responses follows:

▪ **Demographic background**: The majority of the YDP youth that attended the role model activity sessions were male (65%). The youth ranged in age from 13 to 18, with the average age being 16. All of the youth were of Hispanic origin.

▪ **Current occupational status**: About half (52%) of the YDP youth said they were looking for a job, while one-fifth (19%) said they currently held a job.[17] Two-thirds (65%) of the youth also categorized themselves as students. Nearly one-sixth (15%) indicated they were parents.

▪ **Jobs/careers to which the youth aspired**: When asked to identify the future job/career that they were most interested in pursuing, the YDP youth most often pointed to the medical field (19%) and auto repair (19%), followed by professional sports (e.g. football or basketball), hair styling, business, the military, and engineering, each mentioned by 15% of the group. When asked if they already knew someone in their chosen profession, just over two-fifths (42%) of the youth confirmed they did, and all but two of these

---

[16] The project team also implemented a role model session at ¡YouthWorks! which included youth in their work apprenticeship program.

[17] The question relating to occupation had to be revised from the original wording as the project team discovered youth did not know what the term "employed" meant.

mentioned a relative (parent, cousin, uncle), with 1 youth pointing to a friend and another to a professional role model.

- **Amount and type of preparation required for these jobs/careers:** More than two-thirds (65%) of the YDP youth estimated that the job/career they aspired to would require *a lot* of preparation, with the remaining youth estimating *a moderate amount* (26%) or a *little* (9%) preparation. When asked to describe the type of preparation they would need, nearly two-thirds (62%) of the youth said they would need some type of additional schooling, with half (50%) specifying they would need to attend college.

- **Interest in STEM jobs**: Prior to participating in the *STEM Pathways* project, relatively few YDP youth (16%) said they had *little* to *no interest* in finding out about different job opportunities in STEM, while the majority of youth were *somewhat* (38%), *moderately* (27%), or *very interested* (19%).

- **Whether a science job/career was a possibility for them**: When asked whether they felt that working in a science job/career was a possibility for them in the future, just over one-third (35%) of the YDP youth said *yes* and went on to explain one of the following reasons: *I'm good at science and I think cosmetology is kinda science, Technical engineer requires a lot of science, Nothing is impossible, If you're going to dream, dream big,* and *You make great amount of money.* The remaining youth were divided between *no* (31%) and *not sure* (34%) and went on to explain they disliked science as in *I don't like science that much,* had other plans as in *my career won't involve science*, or that they lacked science or math knowledge as in *I didn't really pay attention in math.*

- **What youth considered to be a science job**: When asked to give an example of a science job, more than one-quarter (27%) of the YDP youth said *scientist, and* just under one-quarter (23%) pointed to jobs relating to the environment. Smaller groups of youth referenced minerals or chemicals (15%), lab or experiments (15%), forensics (8%), or said *don't know* (8%), while individual youth pointed to other answers, including fossils or radiology.

- **Media habits**: Half (50%) the YDP youth said they had access to the Internet at home. Nearly half (48%) reported daily use of Facebook and nearly one-third (30%) reported daily use of YouTube; only a small group (13%) indicated they never went to Facebook while a much larger group (57%) indicated they never went to YouTube. The majority of the youth said they never used Twitter (74%), Instagram (74%), or Tumblr (61%).[18]

- **Video creation and sharing**: The majority (61%) of the YDP youth said they owned a cell phone with a camera and Internet access. Two-fifths (40%) of the YDP youth said they had previously made at least 1 video to share on the Internet, with nearly one-fifth (18%) specifying they had done so at least 2-3 times.

3.2b Background of YDI Youth

As with the YDP youth, the 23 YDI youth that attended a role model activity and provided feedback completed a pre-activity survey to give the project team a better understanding of the background of these youth. The youth were asked a short set of questions focusing on their: demographic background, occupational status, interest in STEM jobs/careers, and experience in creating and sharing videos. In some cases, only youth in specific

---

[18] In reflecting on these media use numbers the project team qualified that participants from YDP did not have access to phones or the Internet when incarcerated and that it was unclear whether the youth were answering these questions based on the assumption of their being in or out of the facility. If youth assumed they were being asked about media usage while incarcerated, the project team expected their frequency of usage would be significantly reduced or eliminated.

sessions were asked questions, as specified below. All other questions were asked of youth in both sessions. A brief overview of their responses follows:

- **Demographic background**: Nearly three-quarters (74%) of the YDI youth were male. The youth ranged in age from 12 to 24 with the average age being 15. All of the youth were of Hispanic origin.

- **Current occupational status**: Almost all (91%) of the YDI youth said they were a student. Just over one-tenth (13%) said they currently had a job and more than two-fifths (44%) said they were looking for a job. None of the youth indicated they were parents.

- **Jobs/careers to which the youth aspired**: When asked to identify the future job/careers that they were most interested in pursuing for themselves, the YDI youths' top choices were music (30%) or professional sports (22%) followed by the military (9%), teaching (9%) and engineering (9%). Other jobs mentioned by individual youth including *dentist, artist, cooking, writing,* and *work on computer.*

- **Amount and type of preparation required for these jobs/careers:** Most of the YDI youth estimated that the job/career they aspired to would require either *a moderate amount* (38%) or *a lot* (30%) of preparation. Relatively few youth estimated the jobs/career they aspired to would require a *little (13%)* or *no* (13%) preparation, and a small number leaving the question blank (5%). When youth in 1 session were asked to then describe the type of preparation they would need, nearly half (44%) said they would need some type of additional schooling, while one-third (33%) said they would need some sort of training or practice.

- **Interest in STEM jobs**: Nearly two-thirds of the YDI youth said they had *little* (30%) or *no interest* (30%) in finding out about different job opportunities in STEM, while the remaining youth were *somewhat* (26%) or *very interested* (13%).

- **Whether a science job/career was a possibility for them**: YDI youth in 1 session were asked whether they felt that working in a science job/career was a possibility for them in the future. A small group (14%) said *yes* and elaborated *I know how to do some sciency careers.* The majority of youth, however, said *no* (71%) and went on to explain that they disliked science as in *I don't like science I wouldn't be motivated.* A small group (15%) wasn't sure and simply stated *because I don't know.*

- **What youth considered to be a science job**: YDI youth in one session were asked to give an example of a science job. *Chemicals* were mentioned by one-fifth of the group (22%). Other responses were made by individual youth and included a wide range of responses such as: finding out stuff, project, astronaut, Sandia Labs, Los Alamos Labs, and dissecting.

- **Media habits**: Youth in the same YDI session were also asked to report on their media habits. Most youth (91%) said they had access to the Internet at home. Less than half reported daily use of Facebook and YouTube (43% each), while the remaining youth reported they never used these online media outlets (57% each). The majority of the youth said they never used Twitter (86%), Instagram (100%), or Tumblr (100%).

- **Video creation and sharing**: A minority (29%) of the YDI youth from the same session said they owned a cell phone with a camera and Internet access. Not quite half (43%) said they had previously made at least 1 video to share on the Internet, with nearly one-third (29%) of these youth specifying they had done so at least 2-3 times.

3.3 Youth feedback on the flash mentoring role model activities

After completing the role model activity, the YDP and YDI youth were invited to complete a series of questions about their experience in a post-activity questionnaire. The youth were asked to describe what they liked and did not like about the activity and to answer several questions about the role models that visited, including whether they: enjoyed hearing about their work, felt comfortable asking them questions, felt they could relate to them, liked their use of demonstrations, and felt they were hard to follow. The youth were also asked to reflect on whether their interviewing skills improved and whether they thought or felt differently about STEM jobs/careers as a result of participating and expected to take specific actions in the future. A summary of the youths' feedback is provided below:

- **What youth most liked about the role model activity:** More than half (58%) the YDP youth liked the opportunity to interact with the role models that visited them, as in *I liked how they actually answered our questions* or *I got to talk to different types of people with different stuff*. Some youth described meeting the role models as *cool* or *fun* (15%) or said they liked learning about *all the careers* (15%), or simply that they liked *everything* (12%).

  As with the YDP youth, more than half (52%) the YDI youth said they liked the opportunity to interact with the role models, as in *Meeting amazing new people with different stories.* One-quarter (26%) of the YDI youth liked learning about different career opportunities, as in *learning more about mechanical engineering and about various other careers or jobs.* Just under one-fifth of the youth (17%) offered general praise such as *Today's program was interesting and a great all around experience* or *I learned about stuff I didn't know.* A couple of youth (9%) said they liked *learning about science*.

- **What youth least liked about the role model activity:** About two-thirds (62%) of the YDP youth said there was nothing they disliked. A few youth (15%) pointed to time constraints, as in *we didn't have enough time.* Other aspects disliked by individual YDP youth included: *The topics, Ran out of questions, One on one,* or *Don't know.* The majority of the YDI youth either said there was nothing (38%) they disliked or left the question blank (35%). Small groups of youth disliked the *limited time* (9%) or the *focus on science* (9%) as in *That there was not someone here talking about the music side of science*[19] or *The science theory but it made me see science in a different way*. One other aspect disliked by a youth was that *We had to sit still*.

- **Whether youth enjoyed hearing the role models talk about their work**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), both the YDP and YDI youth tended to agree (median rating 4) that they enjoyed hearing the role models talk about their work. Their individual ratings ranged from 2 to 5 in each group, indicating some differences of opinion in each case.

- **Whether youth felt comfortable asking the role models questions**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), both the YDP and YDI youth tended to agree (median rating 4) that they felt comfortable asking the role models questions. The individual ratings in each group ranged from a low of 2 to a high of 5, indicating some differences of opinion in each case.

- **Whether youth felt they could relate to the role models**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), both the YDP and YDI youth tended to be neutral (median rating 3) about whether they could relate to the role models, with their ratings ranging from 1 to 5 within YDI and 2 to 5 within YDP, indicating some differences of opinion in each case.

---

[19] In response to this request, the *STEM Pathways* team subsequently brought in sound engineers.

- **Whether youth felt the role models were good role models for peers their age**: The youth were asked to reflect on whether they felt the role models they met were good role models for peers their age. In both the YDP and YDI groups, all but one youth who left the question blank agreed that the role models were good role models. Their reasons included that the role models were: industrious, as in *they are positive and are hard worker;* successful, as in *there doing good in life*; inspiring, as in *they inspire you; and/*or informative, as in *they gave us good advice.*

- **How much youth liked hearing the role models talk about their work:** Using a scale from 1 (did not like) to 5 (totally liked), youth in both groups tended to *very much* like hearing the role models talk about their work (median ratings 4 YDP, 4.5 YDI). While the individual ratings ranged from a low of 2 to a high of 5 in each group, more than three-quarters of the YDP (77%) and YDI youth (82%) said they either *very much* or *totally liked* this aspect of the session.

- **How much youth liked the demonstrations given by the role models:** Some of the youth attending the YDI or YDP sessions had an opportunity to see role models give demonstrations as part of their presentations. These demonstrations ranged from cognitive scientists modeling thought-controlled computers to an entomologist bringing live bugs. Using a scale from 1 (did not like) to 5 (totally liked), the YDI youth tended to *moderately like* the demonstrations (median rating 3) while the YDP youth tended to *very much like* them (median rating 4). The individual ratings ranged from to 2 to 5 within YDI and 3 to 5 within YDP, indicating there were some differences of opinion within each group.

- **Whether youth felt the role models were hard to follow**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), youth in both groups tended to disagree or be neutral about whether the role models were hard to follow (median rating 2.5 YDP, 2 YDI); their ratings ranged from 1 to 5 within YDP and 1 to 4 within YDI, indicating some differences of opinion in each case

- **Whether youth felt their interviewing skills improved as a result of the session**: Using a scale from 1 (strongly disagree) to 5 (strongly agree), the YDP youth tended to be neutral (median rating 3) about whether their interviewing skills improved as a result of the session, while the YDI youth tended to agree that their interviewing skills had improved (median rating 4). The youths' individual ratings ranged from 3 to 5 within YDP and 2 to 5 within YDI, indicating some differences of opinion in each case. In both groups, a few youth explained their ratings. Those who felt their skills improved most often elaborated that they weren't afraid as in *I had no fear asking questions* or that they got good practice asking questions as in *I asked more questions and was able to relate to them a little.* Those who didn't feel their skills improved most often explained that they didn't have much opportunity to ask questions, as in *Barely asked questions*, or that they were nervous, as in *I'm still a little nervous to talk.*

- **Whether youth felt they had a better understanding of what is involved in working toward a STEM job:** More than half of the YDI (57%) and YDP (52%) youth said they had a better understanding of what is involved in working toward a STEM job as a result of the session. Those who felt they gained a better understanding explained that they learned how STEM relates to their field of their interest, as in *I learned chemistry is connected to cosmetology*, or that they learned of STEM's value in general, as in *It takes science in almost everything.* Those who felt they didn't gain a better understanding explained that they didn't like STEM, as in *I'm not really a huge fan of science,* or that their career didn't require it, as in *my career won't involve it*, or that there was a lot of information to process, as in *there was a lot to go over.*

- **Whether youth could see working in a STEM field as a result of what they gained during the session:** While just one-third (35%) of the YDP youth said they could see working in a STEM field prior to the session, two-thirds (65%) felt they could see working in one of these fields after the session. Among the YDI youth, less than one-sixth (14%) of the group said they could see working in a STEM field prior to the session, while a slightly larger group (17%), said they could see this after the session. Most of the remaining YDI youth left the question blank or said they were uncertain (53%), as opposed to saying they couldn't see working in one of the fields (30%) after participating.

- **Whether youth felt the role model session caused them to think or feel about their future jobs/career in a new or different way.** The YDP youth were asked if the session caused them to think or feel about their future jobs/career in a new or different way. Most (70%) of these youth confirmed that it did, for one of the following reasons: the session was motivating, as in *it kinda motivates*; the session caused them to reflect on their goals, as in *it got me to think twice* and *it made me think more of what I want to do;* or because they appreciated the professional's message of working hard and pursuing their dreams, as in *they told me not to give up* or *I feel like I can pursue my dream as a musician*.

- **Whether youth were interested in meeting more role models**: Most of the YDP (85%) and YDI (88%) youth indicated they were interested in meeting more professional (role models) in the future. Most often they elaborated that they looked forward to meeting more role models because they wanted to learn about different jobs/careers, as in *I want to learn more about different careers*, or because they wanted to meet more cool or interesting people, as in *cuz they are cool or their interesting.* The small number of youth in each group that indicated they weren't interested in meeting more role models did not elaborate.

- **Whether youth expected to take specific actions in the future as a result of participating in the session.** Youth were asked to estimate how likely they were to take 4 specific actions within the next month as a result of participating in the session, using a scale from 1 (definitely won't) to 4 (definitely will). In general, the youth indicated they would probably take the 4 actions they were asked about, as follows:

  ‣ Youth in both groups indicated they would probably talk to someone (like a friend, family member, or teacher) about the role models they met in the session. The median ratings in both groups were 3.0. Where all of the YDP ratings were 3.0, the YDI ratings ranged from 2 to 4.

  ‣ The YDP youth indicated they would probably talk to someone about something they learned from the session (median rating 3.0) while the YDI youth were slightly less inclined to do so (median rating 2.5). The YDP ratings ranged from 2 to 4 while the YDI ratings ranged from 2 to 3.

  ‣ The YDP youth indicated they would probably look for more information about the role models' STEM jobs (median rating 3.0) while the YDI youth indicated they were slightly less inclined to do so (median rating 2.5); The YDP ratings ranged from 1 to 4, while the YDI ratings ranged more narrowly, from 2 to 3.

  ‣ Youth in both groups tended to estimate they would probably look for more information about other STEM jobs (median rating 3.0); the ratings within both groups ranged from 3 to 4.

3.4 Role model feedback on the *STEM Pathways* flash mentoring role model activities

The *STEM Pathways* team recruited the 35 role models for the flash mentoring activities from a variety of sources, including: Sandia and Los Alamos National Labs (where role models are paid for their volunteer participation), professional industry networks, university campuses, and personal connections. The *STEM Pathways* project team prioritized recruiting Hispanic role models and those who had an accessible story that would likely relate to at-risk youth.

The participating role models were formally recruited via an online form, and then asked a series of questions to determine how well they might engage with youth interests. Once role models were matched to a specific group and date, a pre-activity survey was given. After the role models completed their role model session with youth, they were asked to complete a post activity survey about the most valuable aspect of the activity, what they found surprising, whether the youth met their expectations, how they planned for the activity, what they learned about the youth through the activity, and other reflections they had about participating.

Of the 35 recruited role models, one-quarter (n=9) completed both pre- and post-activity surveys, including five males and four females.[20] A summary of their responses follows below:

- **What the role models found to be the most valuable aspect of the program:** Six of the nine role models felt that *interacting with and talking to the youth* was the most valuable aspect of the program for various reasons including, but not limited to: *making an impact on their future* and *learning about perceived barriers to STEM careers*. One role model described *learning about the youth and the incarcerated system,* while another wrote *being asked questions by the youth,* and yet another pointed to *the demos because they encouraged more questions and made it possible to exchange more information.*

- **Whether anything happened in the program that surprised the role models?** Four of the role models indicated that nothing surprised them, while the remaining five indicated something did surprise them, primarily because the youth seemed more *engaged, interested* and/or *open* than they expected. One role model indicated being surprised because she *didn't understand another role model's demonstration* and that she had expected the demonstrations to be *designed for people under 20*.

- **Whether the youth met the role models' expectations:** Four of the role models who answered this question felt that the youth met their expectations, primarily because the youth showed *genuine interest* and *were eager to participate,* while one role model noted that the *pre-event material was helpful preparation*. Three others, however, felt the youth did not meet their expectations, one of whom gave explanations similar to those given by the role models that felt the youth did meet their expectations, but in this case observing that the youth were more e*ager* to participate then they anticipated. The other couple of role models noticed that the youth were *younger, more diverse,* and *more gender balanced* than expected. Among the remaining role models, one indicated having no prior expectations of the youth and one left the question blank.

- **What the role models learned about the youth through the program:** All but one role model indicated they learned something about the youth. Four realized that youth wanted and needed help, one of whom noted that *even though they've gotten into trouble they want to work on their lives,* while another discovered

---

[20] Five (5) of the 9 role models participated at YDI in Albuquerque, NM. Three (3) of these 5 role models were at YDI on May 7th, 2013 and 2 of these 5 role models were at YDI on May 28th, 2013. Four (4) of the 9 role models participated at YDP in Santa Fe, NM. Two (2) of these 4 role models were at YDP on May 9th, 2013 and 2 of these 4 role models were at YDP on May 16th, 2013.

youth *are still driven to accomplish their dreams*. Three role models learned the youth were *eager to connect with people*, one indicated being *surprised at how shy they were* and had *expected them to be more aggressive* and another indicated learning more about incarceration in the U.S.

- **How difficult the role models found it to come up with examples or stories to tell the youth:** Using a scale from 1 (extremely difficult) to 7 (extremely easy) the role models generally indicated they found it *very easy* (median rating 6) to come up with examples or stories, although their ratings ranged from 4 to 7, indicating there were some differences of opinion within the group.

- **How effective the role models thought the examples/stories were with the youth:** Six of the role models who answered this question indicated they felt the examples/stories were *effective* or *very effective*, while a couple of others indicated they were *somewhat effective*. When invited to elaborate, four role models said that the youth being able to *relate* to them was likely associated with being more effective. The two role models who marked *somewhat effective* explained that youth were interested but some *weren't comfortable communicating* or they suggested that *sticking to smaller, more specific examples could be more effective*. One role model expressed hope that the examples/stories were effective, saying *time will tell*, while another explained that giving examples helped the youth become more interested.[21]

- **How helpful the role models felt the prop/demo was in facilitating conversation and soliciting STEM related questions from youth.** Using a scale from 1 (not helpful at all) to 7 (extremely helpful) the two role models who said they brought a demonstration for their presentation indicated it was *somewhat helpful* (3) or *moderately helpful* (5). The role model who indicated the prop/demo was somewhat helpful explained that *the demo was effective in gaining attention during the large group* however *there were no STEM-related questions in the small groups*. The role model who indicated the prop/demo was moderately helpful described the prop as *distracting* yet could be *valuable when talking to participants who are more interested and knowledgeable.*

- **What questions the role models heard the youth ask that stood out or stuck with them:** Three role models observed that youth asked about *challenges* they faced, pointing to one of the sample questions from which youth were given to choose. A couple of role models inquired about their *own experiences* with mentors, while a couple others recalled questions about their *personal lives*, and another reported that *nothing sticks out*.

- **Whether the youth asked any questions that the role models didn't anticipate and/or felt they didn't want to answer:** All but one role model felt there were not any questions they did not anticipate or didn't want to answer. Three further explained their answer, with a couple saying all questions were *appropriate* and *fair game,* while the third expressed the ability to *answer all questions honestly and to the best of my ability*. The remaining role model said the *program list of questions (referring to the sample questions) helped* and the only question that made him or her uncomfortable was *about salary.*

- **Whether anything happened during the program that made the role models feel uncomfortable:** All but one role model indicated that nothing made them feel uncomfortable during the program. The role model that felt uncomfortable reflected that this was because some of the youth shared very personal things and s/he was unsure if *any of these experiences that the youth shared needed to be reported.*[22]

---

[21] After the initial role model sessions, *STEM Pathways* teams learned to prompt role models to prepare specific stories and narratives to share with youth about their jobs and, specifically, the struggles, hardships, and decisions they made to get where they are.

[22] Role models were prepped specifically not to ask personal questions about youth (from YDP) as sharing criminal

- **Additional information the role models would have liked to receive before participating in the program:** Three of the eight role models who answered this question said they felt *well prepared* prior to participating in the program. The remaining five indicated having different wants, including: wanting more *advice on the types of questions*, wanting more *information about the different programs in the facility,* wanting more *demographic information,* wanting *short bios of the youths' interests* in order to *tailor demos to them,* and wanting adult *follow up with the sensitive and personal shares of the youth.*

- **How the role models reflected on the role model program as a whole:** The role models were asked to indicate how much they agreed or disagreed with a series of statements about their experience in the role model program as a whole, using a scale from 1 (strongly disagree) to 7 (strongly agree). Overall, they tended to *strongly agree*: that they received adequate information to effectively prepare for the program (median rating 7, range 6-7); that they enjoyed participating in the program (median rating 7, range 6-7); and that the program should be continued (median rating 7, range 6-7). Meanwhile the role models tended to *agree* the program was well run (median rating 6, range 4-7); that the youth who participated in the program enjoyed it (median rating 6, range 4-7) and that as a result of the program they had a better understanding of how to talk to at-risk youth about STEM (median rating 6, range 4-7) and about their careers (median rating 6, range 4-7).

  The role models were also asked to explain any of their previous ratings from the previous questions. Three 9 role models gave further explanations. One explained they only rated "agree" to the youth enjoying the program because *it was our first meeting and if we kept going back they would enjoy it more*. The other two role models claimed not to have the *background to determine if this group 'enjoyed' the program,* or said *I felt the program definitely improved my ability to communicate with the youth* and that *the first session was hard, but it got easier,* referring to the "rounds" of discussion*.

- **What role models felt were the most effective elements of the program:** Five role models identified the flash mentoring activities as the most effective element, three of whom also mentioned the use of props and demos, while two found the introduction at the beginning of the activity to be most effective. Of the remaining four role models, one listed *role models who could relate to youth,* one liked *allowing the participants to generate their own questions,* one expressed they would *like to participate more before giving feedback*, and one left this question blank.

- **What role models felt were the least effective elements of the program:** Four role models requested more time for the flash mentoring sessions; in order to accomplish this, a couple of role models suggested having *fewer role models* and *running the program more frequently*, while another suggested allowing the youth to *spend more time with the mentors that interest them most*. Two role models left this question blank, while among the remaining role models, one mentioned being *unsure* that a *blogger qualifies as a STEM career,* one expressed difficulty in following one of the demos, and one expressed he or she would *like to participate more before giving feedback.*

- **What were the role models main goals for participating in the program:** Five role models said they participated in the program because they wanted to connect with youth and/or make a positive impact on youth; one of these role models further reflected s/he would like to do this so as to help youth *see they can have a successful career without breaking the law*. The remaining four expressed goals related to teaching, and engaging with *future scientists*. One role model felt s/he wanted to give back to the youth because *I have been lucky and would have benefited from this kind of program* and another left the question blank.

---

information was a potential security hazard and concern of YDP staff.

- **Whether the professional felt their goals were met:** Seven of the eight role models that completed this question indicated that they felt their goals were met**.** One role model felt unsure if his/her goals were met, and reflected s/he *might have needed more time to have a larger impact.*

- **To what extent did the role models' experience in the program affect their view of the value of communicating to at-risk youth about the kind of STEM work they do:** Using a scale of 1 (not at all) to 7 (to a great extent) the role models generally indicated that their view of communicating to at-risk youth was *affected to some extent* (median rating 4), although their ratings ranged from 1 to 7, indicating there were differences of opinion within the group. When asked to explain their ratings, the handful of role models who gave higher ratings placed value on *positively influencing* the youth, and modeling success. Three of these role models further explained that they were able to demonstrate that at-risk youth can be successful and *they get to see not only privileged people are successful.* The few role models who gave lower ratings explained that they valued this type of program before participating; as one role model explained, *My view wasn't changed. I continue to believe it's important to focus STEM activities on at-risk youth.* Another professional clarified they *didn't need to experience the program to appreciate the value.* The remaining professional left the question blank.

- **Whether the role models had any resource information to share with youth:** Two role models offered resource information they would like to share with the youth. One mentioned several youth employment and/or leadership programs such as 4-H, Future Farmers of America (FFA), Sandia National Lab's student employment program, and the Youth Conservation Corps in Oregon. Another provided a few websites where youth learn about their career of interest (www.onetonline.org) or computer programming (codeacademy.com and code.org).

- **Whether the role models would recommend the *STEM Pathways* program to other STEM role models interested in becoming a role model.** Seven role models indicated they would recommend the program, while one said it depended, and another left the question blank. Among the group of seven who said they would recommend the program, one role model explained his/her belief that *it takes the right kind of person to be a role model* and highlighted important characteristics such as being *open and honest.* The remaining six role models praised the program for being *well run* and a *rewarding* experience because it provided an opportunity to talk to youth about STEM and find out what interests them. One of these role models declared they *already sent an email to* the proctor *to get more people from Sandia [National Labs] involved.*

- **Whether the role models had any advice for future role models that participate in this program:** Four of the eight role models who responded to this question centered their advice on how to *keep communications going* while interacting with the youth by *listening*, *thinking of stories to share,* and using *demos* and/or *props.* Three advised future role models to be *authentic* and *honest.* The remaining professional said s/he wants *to participate more before giving feedback*.

- **Whether role models were willing to recruit their colleagues to participate in the *STEM Pathways* program.** Seven role models expressed willingness to help recruit their colleagues, one of whom indicated they already had. One role model expressed an ability to *be persuasive,* while yet another said s/he would do what s/he could to help but that s/he doesn't *work alongside other colleagues*. Another role model said they *want to participate more before giving feedback.*

- **Whether the role models had advice for how the program could best be framed to attract their colleagues or other STEM role models:** Four role models said they did not have any advice about how to

frame the program to attract more role models, one of whom explained that the *current description is sufficient*, while the other role models found it *hard to say* and that they would *need to participate more* before giving advice. Three others, however, made suggestions: One expressed that *time might be a problem* and suggested *later meetings during the week or weekends*, one made the suggestion to *emphasize* this as an *opportunity to change the path of these youth's future*, and one had suggestions for professional Listserv lists where the program could be advertised (Local chapters of American Society of Safety Engineers, and American Industrial Hygiene Association).

- **Whether the role models' had suggestions for how our staff could improve the program to make it work better for future STEM role models:** Three role models responded that they did not currently have suggestions for improving the program, one of whom explained this was because *the basic structure of the program is sound and it'll do great*, while another role model said they would like to *participate more before giving feedback*. Two others suggested allowing *more time* with the youth. One role model suggested *field trips* and having mentors help youth further pursue their career interests. Finally, one role model commented that *one of the adults at YDI spoke a lot during the session and I thought it detracted from the youth's experience.*[23]

---

[23] Referring to YDI staff members who sometimes sat in on discussion sessions with youth.

Summary of findings

This final section of the report summarizes the project' main findings and is followed by a discussion that looks at the extent to which the project's goals were met as well as the implications for future work.

Part 1: Youth feedback on the *STEM Pathways* media activities

The *STEM Pathways* media component comprised two types of activities: video creation and screenings. The *STEM Pathways* team worked with YDI to create a set of youth-produced videos which were subsequently screened at the Wool Warehouse in a public celebratory event for their friends and family. The youth videos were later screened at YDP as a regular activity session where youth participants had no personal connections to youth media producers and no prior experience with *STEM Pathways* activities. The videos were also hosted on the project's related Tumblr site (http://pathwaystostem.tumblr.com/videos) and youth were encouraged to continue video production.

A total of 37 youth attended a *STEM Pathways* video screening and provided feedback, including 27 youth who the watched the videos at the YDI Wool Warehouse event on August 1, 2013 and 10 youth who subsequently watched the videos at YDP a week later.

Background of YDP youth

Most of the 10 YDP youth that attended the video screenings at YDP and completed surveys were male and of Hispanic origin. The youth ranged in age from 14 to 18, with the average age being 16. Almost all of the youth were students and none said they were parents. Half said they were looking for a job and two-fifths said they currently held a job. The YDP youths' top choices for jobs/careers to which they aspired were: the military, professional sports, and auto repair. Nearly three-quarters of the youth confirmed they knew someone in the job/career to which they aspired. All of the YDP youth estimated that the job/career they aspired to would require *a lot* of preparation and that they would need some type of additional schooling, with nearly one-third specifying college.

Prior to the screenings, half of the YDP youth said they had *little* to *no interest* in finding out about different job opportunities in STEM, while nearly a third were *moderately interested* and a tenth were *very interested*. Two-tenths of the youth indicated that working in a science job/career was a possibility for them in the future. The remaining youth were divided between *no* and *not sure* and went on to explain that they disliked science or had other plans. When asked to give an example of a science job, relatively few youth specified an actual job. More often the youth gave a word or phrase such as *technology* or *experimenting*.

Background of YDI youth

Unlike the youth from YDP, most of the 27 youth who attended the video screening and provided feedback at the YDI Wool Warehouse event had prior involvement with the *STEM Pathways* project. Nearly three-quarters had participated in a previous role model or art activity. Given these youths' prior experience and the time constraints involved in administering surveys at the Wool Warehouse event, the YDI youth only completed a post-viewing survey, rather than both a pre-viewing and post-viewing survey as occurred at the YDP session. The YDI post-viewing survey gathered limited background information about the youth and their backgrounds.

Most of the 27 YDI youth that attended the video screening and completed surveys were male and of Hispanic origin. The youth ranged in age from 13 to 25 with the average age being 15. None were parents. More than half

said they were students, and less than one-tenth currently held a job. Two-fifths said they were involved in helping to create one or more of the videos that were shown at the screening. More than half learned about the event from YDI or another organization, and two-fifths said they heard about the event from friends.

Youth feedback on creating the videos

To explore the extent to which the youth-produced videos helped develop leadership and communication skills among the participating youth, these youth were invited to complete a follow-up online survey, which was filled out by five of the approximately eight youth that participated in this program offering, all of them young men.

In general, the youth indicated that they learned about both STEM and STEM jobs, and that their communication and leadership skills improved through the researching, writing, interviewing, filming, communicating, experimenting, and/or video skills that they learned and practiced. All five youth also wanted to make more STEM videos in the future, and all but one said they *totally* enjoyed sharing the videos at a local screening. In general, they estimate that their interest in STEM jobs increased after participating in the *STEM Pathways* program, and all of the youth expressed an interest in participating in more STEM-related programs in the future. Follow-up reports from supervising staff of YDI youth also indicated that the youths' leadership and communication youths' skills had improved through the program.

Youth feedback on the screening videos

The youth at YDP and YDI liked various aspects of the videos. Most often they pointed to the fact that the videos involved the use of teens, were cool or exciting to watch, included rap, featured interviews, or showcased something interesting about STEM. No one issue stood out as a problem for the majority of the youth, and the few youth who pointed to something they disliked described the videos as occasionally being slow, boring, or having poor sound quality.

Youth largely agreed that the videos had high learning value. The majority of the youth from both YDP and YDI felt that they learned *a moderate amount* or *a lot* about STEM jobs/careers, and also about the education, training, or skills needed to obtain a STEM job/career. While there were no common themes among the YDP youths' answers about what they learned about STEM jobs/careers, YDI youth most often said they learned about: firefighting (which was the focus of 1 video); how STEM jobs/careers use or involve science or math; and/or the money that can potentially be earned through STEM careers.

Nearly two-thirds of the YDP youth and nearly half of the YDI youth felt that the videos caused them to think about science or math in a new or different way. These youth most often characterized STEM as more fun, cool, interesting, prevalent, or lucrative than they previously realized. Those who felt the videos did not cause them to think or feel differently explained that they thought these subjects were boring or unappealing, or that they didn't see that the videos had anything to do with science or math.

Youth in both groups tended to be neutral about whether they would share the videos with their friends or family members, although there were some differences of opinion about this issue. YDP youth tended to agree that the videos shown at the screening, or at least similar videos, could inspire their friends to learn more about STEM or STEM jobs/careers and they also expressed interest in making similar videos in the future. The YDI youth tended to be neutral about both of these issues, which could be attributed to the fact that some had helped produced the videos shown at the screening. While youth in both groups tended to be neutral about whether they would like to see the *same* videos shown at the screening again, they largely agreed that they would like to watch *similar* videos.

About half of the youth in each group expressed interest in seeing more videos that feature youth interviewing STEM role models. YDP youth most often explained that the interviews were interesting, cool, or informed them about different jobs. YDI youth expressed similar reasons, although a few youth also observed that they: enjoyed watching other youth, felt the process of interviewing was empowering to youth, and/or that they would enjoy being inspired by role models. Among the youth who were not interested in seeing more videos of youth interviewing STEM role models, the YDI youth reflected that they found the videos *boring*, or that they already saw *a lot* of role models, likely referencing back to their involvement in prior *STEM Pathways* role model sessions. The YDP youth, who didn't have this experience, instead reflected that the types of jobs depicted in the videos weren't the type of jobs they aspired to.

Finally youth in both groups indicated they would prefer to see videos like those shown in one of three places: on YouTube, at their own youth organization, or on Facebook. Where nearly three-quarters of the YDP youth expressed interest in watching the videos at school, only one-quarter of the YDI youth pointed to this option. When the YDI youth were asked to indicated their interest in visiting the Tumblr *Pathways to Brighter Futures* site, one-quarter responded that they were *very interested* in checking out the site, while one-fifth each said they were *moderately*, *somewhat*, or *slightly interested*.

Part 2: Youth feedback on the *STEM Pathways* art activities

A total of 29 youth attended an art activity session offered through the *STEM Pathways* program and provided feedback via written survey. This group of 29 included 20 youth at YDP and 9 youth at YDI.

Background of YDP youth

Most of the 20 YDP youth that attended the art activity and completed surveys were male and of Hispanic origin. The youth ranged in age from 14 to 18, with the average age being 16. Three-quarters of the youth were students and one-fifth said they were parents. Nearly half said they were looking for a job and one-fifth said they currently held a job. The YDP youths' top choices for jobs/careers to which they aspired were: the military, professional sports, and auto repair. Two-fifths of the youth confirmed they knew someone in the job/career to which they aspired, almost always a relative. Nearly three-quarters estimated that the job/career they aspired to would require *a lot* of preparation and that they would need some type of additional schooling, with two-thirds specifying college.

Prior to participating in the art session, more than half the YDP youth said they were *moderately* to *very interested* in finding out about different job opportunities in STEM, with nearly one-third saying they were *somewhat interested*, and the rest indicating that they had *little* to *no interest*. Two-fifths of the youth indicated that working in a science job/career was a possibility for them in the future, and went on to explain that: they were good at science or were smart, STEM had good earning potential, that there was a need for more scientists, or that anything was possible. The remaining youth were divided between *no* and *not sure* and went on to explain that they disliked science or had other plans. When asked to give an example of a science job, relatively few youth specified an actual job other than *scientist*, although *engineer* was occasionally mentioned. More often the youth gave a word or phrase such as *chemicals* or *studying planets*.

More than two-thirds of the YDP youth said they both owned a cell phone with a camera and Internet access, and had access to the Internet at home. Not quite half said they had previously made at least 1 video to share on the Internet, with nearly one-fifth having done so at least 2-3 times. Half of the youth reported daily use of Facebook

and one-quarter daily use of YouTube. About three-quarters of the youth said they never used Twitter, Instagram, or Tumblr.

Background of YDI youth

Most of the 9 YDI youth that attended the art activity and completed surveys were of Hispanic origin and all but one was male. The youth ranged in age from 13 to 24 with the average age being 16. None were parents. More than half said they were students, and about one-fifth currently held a job while one-third said they were looking for a job. The YDI youths' top 2 choices for the jobs/careers to which they aspired were the military and professional sports, each mentioned by one-fifth of the group. More than three-quarters of the youth confirmed they knew someone in their chosen professions, all but one of whom pointed to a friend or relative. Most estimated that their chosen job/career would require a *moderate* amount of preparation; all but one youth pointed to needing some type of additional schooling, with more than half specifying college.

More than half the YDI youth indicated they were *somewhat* to *moderately* interested in learning about different job opportunities in STEM, while the remaining youth had *little* to *no interest*. When asked whether they felt that working in a science job/career was a possibility for them in the future, none of the YDI youth said *yes*. The majority of youth said *no* or indicated they weren't sure and went on to explain that they disliked science, weren't good at it, or had other interests. When asked to give an example of a science job, the two most common responses were *labs* and *biologist*. Other responses ranged widely, and included words or phrases such as *astronomer*, *chemical weaponry making*, *money*, and *body movement*.

More than two-thirds of the YDI youth said they previously made at least 1 video to share on the Internet, with one-third specifying they had done so at least 2-3 times. Unlike YDP, however, YDI has a media component to its programming where youth are encouraged to write and record music, which facilitated the youths' engagement with video creation and sharing.

Youth feedback on the art activity

Overall, youth in both YDP and YDI groups indicated that they liked doing the art activity. When asked to describe what they liked, the YDP youth most often cited the opportunity of looking to the future or the activity of drawing or doing art, followed by the activity being fun or allowing for creative expression. The YDI youth, most often said they liked doing the art activity in general, with some youth specifying that they liked writing about what they made or using the glitter provided.

When asked to describe what they disliked about the art activity, more than half the YDP youth said there was nothing they disliked. The most common complaint was that they had to rush or had difficulty figuring out what to draw. While two-fifths of the YDI youth said there was nothing they disliked about the activity, a small group did not like the amount of talking involved in the discussion portion.

A minority of the youth in each group, less than one-third within YDP and less than one-tenth within YDI, found some aspect of the activity confusing. Their main confusions were not understanding the activity or finding it difficult to think about what to draw. More often the youth described the activity as easy or said it was fun or cool.

The YDP youth were asked a few additional questions about the supplemental discussion that followed their art activity. Overall these youth indicated they *moderately liked* the discussion and were *moderately comfortable* sharing what they made, including discussing their career goals. The YDP youth were also asked whether they were interested in doing more art activities, to which more than four-fifths indicated they were, saying that the

experience was fun, interesting, or because it enabled them to express themselves. A small group of YDP youth indicated that they were not interested in doing more activities because they found it hard to draw, felt they had no imagination, or did not like art.

Part 3: Youth and role model feedback on the *STEM Pathways* flash mentoring with role models activity

A total of 49 youth attended a role model activity session offered through the *STEM Pathways* program and provided feedback via written survey. This group of 49 included 26 youth at YDP and 23 youth at YDI.

Background of YDP youth

Two-thirds of the 26 YDP youth were male. The youth ranged in age from 13 to 18, with the average age being 16. All of the youth were of Hispanic origin. Two-thirds of the youth were students and nearly one-sixth of the youth were parents. About half of youth said they were looking for a job, while one-fifth said they currently held a job. When asked to identify the future job/career that they were most interested in pursuing, the YDP youth most often aspired to jobs in the medical field and auto repair followed by professional sports, hair styling, having a business, the military, or engineering. Just over two-fifths of these youth confirmed they knew someone who was in their chosen job/career, most often a relative. More than two-thirds estimated that their desired job/career would require *a lot* of preparation. When asked to describe the type of preparation, nearly two-thirds expected to need some type of additional schooling, with half specifying college.

Prior to participating in the *STEM Pathways* project, more than four-fifths of the YDP youth were at least *somewhat interested* in finding out about different job opportunities in STEM, with less than one-fifth indicating *no interest*. When asked whether they felt that working in a science job/career was a possibility for them in the future, just over one-third of the youth said *yes* and went on to explain that: they were good at science, the field they chose involved science, science is a lucrative field, or that nothing is impossible. The remaining two-thirds of the youth were divided between *no* and *not sure* and went on to explain they disliked science, had other plans, or that they lacked science or math knowledge. When asked to give an example of a science job, more than one-quarter of the youth said *scientist,* and just under one-quarter pointed to jobs relating to the environment. Smaller groups of youth referenced *minerals* or *chemicals*, *lab* or *experiments*, *forensics*, or said *don't know*.

Half the YDP youth said they had access to the Internet at home. Nearly half also reported daily use of Facebook and nearly one-third reported daily use of YouTube. Most of the youth, roughly three-quarters each, said they never used Twitter or Instagram. Three-fifths said they never use Tumblr. Two-thirds of the youth said they owned a cell phone with a camera and Internet access. Two-fifths said they had previously made at least 1 video to share on the Internet, with nearly one-fifth specifying they had done so at least 2-3 times.

Background of YDI youth

Three-quarters of the YDI youth were male, and the youth ranged in age from 12 to 24 with the average age being 15. All of the youth were of Hispanic origin. Nine-tenths of the youth were students while none were parents. Just over one-tenth said they currently had a job and more than two-fifths said they were looking for a job. The YDI youths' top choices for jobs/careers were music or professional sports followed by the military, teaching, or engineering. More than two-thirds of the youth estimated that the job/career they aspired to would require either a *moderate* amount or *a lot* of preparation. When youth in 1 session were asked to then describe the type of

preparation they would need, nearly half said they would need some type of additional schooling, while one-third pointed to some sort of training or practice.

Nearly two-thirds of the YDI youth said they had *little* or *no interest* in finding out about different job opportunities in STEM, while the remaining one-third were *somewhat* or *very interested*. YDI youth in one session were further asked whether they felt that working in a science job/career was a possibility for them in the future. Nearly three-quarters of these youth said *no* and went on to explain that they disliked science*,* while the remaining youth indicated they weren't sure or said *yes* and elaborated they already knew how to do "science type" jobs. Youth in this session were also asked to give examples of a science job to which one-fifth of the group mentioned the word *chemicals* while other youth gave various responses.

When youth in this session were further asked to report on their media habits, four-fifths said they had access to the Internet at home. Less than half reported daily use of Facebook and YouTube. More than four-fifths of the youth said they never used Twitter while none used Instagram or Tumblr. Less than one-third of the youth said they owned a cell phone with a camera and Internet access. Not quite half said they had previously made at least 1 video to share on the Internet, with nearly one-third of these youth specifying they had done so at least 2-3 times.

Youth feedback on the flash mentoring role model activities

More than half the youth from YDP and YDI indicated that what they most liked about the role model activity was the opportunity to interact with the role models who visited them. Some youth in each group indicated they liked learning about the different careers that were featured or they offered general praise for the activity. Relatively few youth in each group pointed to something they didn't like about the activity. The one common issue cited by both groups was time constraints, although this was mentioned by just one-sixth or less of the youth in each group. A few youth in each group disliked the chosen topics or focus on science.

More than three-quarters of the youth in each group said they *very much* or *totally* liked hearing the role models talk about their work, and tended to agree that they felt comfortable asking the role models questions. YDP and YDI youth also tended to disagree that the role models were hard to follow. Although the youth in both groups tended to feel neutral about whether they could relate to the role models, they overwhelmingly agreed that the role models were good role models for themselves and their peers. Their reasons included that the role models were: industrious, successful, inspiring, or informative. More than four-fifths of the YDP and YDI youth indicated they were interested in meeting more role models in the future. Most often they elaborated that they looked forward to meeting more role models because they wanted to learn about different jobs/careers or because they wanted to meet more cool or interesting people.

Some of the youth attending the YDI or YDP sessions had an opportunity to see role models provide demonstrations as part of their presentations, ranging from cognitive scientists modeling thought-controlled computers to an entomologist bringing live bugs. Generally speaking, youth in both groups liked the demonstrations, with YDP youth being particularly favorable about the presentation element.

The YDP youth tended to be neutral about whether their interviewing skills improved as a result of participating in the flash mentoring sessions, while the YDI youth tended to agree that they did. Those who felt their skills improved most often elaborated that they weren't afraid or that they got good practice asking questions. Those who did not feel their skills improved most often explained that they didn't have much of an opportunity to ask questions or that they were nervous.

More than half of the YDI and YDP youth said they had a better understanding of what is involved in working toward a STEM job as a result of the session. Those who felt they had a better understanding explained that they learned how STEM relates to their field of their interest or that they learned of STEM's value in general. Those who felt they didn't gain a better understanding explained that they didn't like STEM, their career didn't require STEM, or there was a lot of information to process.

While just one-third of the YDP youth said they could see working in a STEM field prior to the session, two-thirds felt they could see working in one of these fields after participating in session. Among the YDI youth, less than one-sixth of the group said they could see working in a STEM field prior to the session, while a slightly larger group, about one-fifth, said they could see this after the session; most of the remaining YDI youth left the question blank or said they were uncertain, as opposed to saying they couldn't see working in one of the fields.

The YDP youth who were asked if the session caused them to think or feel about their future jobs/career in a new or different way confirmed that it did because of one of the following reasons: the session was motivating, the session caused them to reflect on their goals, or because they appreciated the professional's message of working hard and pursuing their dreams.

Finally, when youth were asked to estimate how likely they were to take specific actions within the next month as a result of participating in the session, in general, the youth in both the YDP and YDI groups indicated they would probably talk to someone (like a friend, family member, or teacher) about the role models they met in the session and would look for more information about other STEM jobs. While the YDP youth indicated they would probably talk to someone about something they learned from the session and look for more information about the role models' STEM jobs, the YDI youth were slightly less inclined to do both of these things.

Role model feedback on the *STEM Pathways* flash mentoring role model activities

When asked to reflect on the flash mentoring role model program as a whole, the role models tended to strongly agree: that they received adequate information to effectively prepare for the program, that they enjoyed participating in the program, and that the program should be continued. Meanwhile, the role models tended to agree that the program was well run, that the youth who participated in the program enjoyed it, and that as a result of the program they had a better understanding of how to talk to at-risk youth about STEM and about their careers.

While the role models generally indicated they felt prepared for their sessions with the youth, several indicated they would have liked additional information relating to, for example: the types of questions youth might ask, the different programs targeted, the demographics and background of the youth, and the sensitive nature of the information shared by youth.

When asked to identify the most and least effective elements of the program the role models tended to praise the flash mentoring activities but also observed that too little time was provided for this activity. They also suggested either having fewer role models and running the program more often or giving the youth more time with the role models that most interested them.

The role models tended to describe the most valuable aspect of the program, for them personally, as the time they had interacting with the youth. The majority of the role models indicated that the youth met their expectations primarily because they showed genuine interest and were eager to participate. A few felt the youth did not meet their expectations because they were younger, more diverse, and more gender balanced than expected. Just over

half of the role models indicated that something surprised them about or during the program, most of whom noted that they were surprised that the youth were *engaged*, *interested*, and/or *open*. Almost all of the role models indicated that they learned something about the youth, most often that the youth wanted and needed help or that the youth were eager to connect with people.

The role models generally indicated they found it very easy to come up with examples or stories and felt these examples/stories were effective with the youth. When invited to elaborate, they most often reflected that being able to relate to youth was an important factor, and likely associated with their ability to be more effective with the youth. The two role models who said they brought a demonstration for their presentations said they found the demos/props to be *somewhat* to *moderately* helpful in facilitating conversation and soliciting STEM-related questions from the youth.

The role models reflected that the youth questions that most stood out for them asked about challenges they faced in their own professional or personal lives. In general the role models did not feel that the youth asked questions that they had not anticipated or did not want to answer, nor did they feel that anything happened during the program that made them uncomfortable.

The role models felt their goals for participating in the program were generally met, which they tended to describe as getting involved to connect with youth and/or making a positive impact on youth. They further reflected that, as a result of participating in the project, their view of the value of communicating with at-risk youth was affected to some extent, although their ratings indicated there were differences of opinion within the group. When asked to explain their ratings, those who gave higher ratings placed value on positively influencing the youth, and modeling success. Those who gave lower ratings tended to explain that they valued this type of program before participating.

Most of the role models indicated that they would recommend the role model program to other adults interested in becoming a STEM role model, with 1 qualifying that it depended on the interested role model, as important characteristics such as honesty and openness were critical. Most of the role models said they were willing to recruit their colleagues to participate in the *STEM Pathways* program, except for two role models who either left the question blank or preferred to have more time in the program before committing.

When asked if they had any advice for future role models, a few cited the importance of *listening* to the youth, *thinking of stores to share*, and using *demos/props*. In terms of attracting future STEM role models to the program, just under half thought the current program description would be sufficient. The three role models who thought this aspect of the program could be improved suggested finding better times for working role models, emphasizing the opportunity to make a difference in the youths' lives, and advertising the program on a variety of professional Listserv lists.

Discussion

The *STEM Pathways* project focused on exploring strategies through which at-risk and incarcerated Hispanic youth could be engaged around STEM careers, understand the education, training, and skills they would need to attain them, and think that such a path was a future possibility. To this end, the project and evaluation teams collaborated on a literature review, the development of a logic model, and the design, implementation, and evaluation of a diverse set of program activities that included media, art, and flash mentoring with STEM role models. This work was structured around the following 4 goals:

1) At-risk Hispanic youth will increase their awareness and knowledge about STEM careers and the education, training, and skills needed to attain them.
2) At-risk Hispanic youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area.
3) At-risk Hispanic youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/visioning art directives.
4) At-risk youth-produced social media about STEM careers will develop leadership & communication skills among At-risk Hispanic youth.

The teams further collaborated to identify specific objectives for each of these goals, some of which applied to all activities (media, art, and flash mentoring) while others applied to just one activity, most often the flash mentoring activity, with which youth had the most time to engage. The project team hoped that if there was evidence of the potential for the project to be impactful, there would be a recommendation that the idea was worthy of further development and that the identified goals and objectives would be likely to be achieved if the project was expanded.

Extent to which project goals were met

Based on the *STEM Pathways* logic model in Appendix 1, the evaluation findings reveal that project goals were generally met, as outlined below.

Goal 1: *At-risk Hispanic youth will increase their awareness and knowledge about STEM careers and the education, training, and skills needed to attain them.*

The corresponding objectives, as outlined in the logic model, were largely met with YDP and YDI youth:

- The youth from both groups reported they enjoyed doing the art and flash mentoring activities and that they enjoyed watching the youth-produced videos. They were also able to describe what they most enjoyed in each case.

- The youth from both groups indicated they were comfortable doing the activities provided to them (sharing and discussing what they made in the art activity, and asking the role models' questions and participating in discussions in the flash mentoring activities).

- With respect to the flash mentoring activities, the youth from both groups said they enjoyed meeting the role models, hearing them talk about their work, and watching their demonstrations (when applicable). The youth were also able to describe what they most liked about meeting the role models, most often focusing on their interactions with the role models and the opportunity to learn about their different careers. Although the youth

tended to feel neutral about whether they could relate to the role models, they overwhelmingly agreed that the role models were good role models for people their age. Note that while half of the role models reflected that being relatable was a key factor in their conveying effective stories to youth, the youth apparently still felt the role models could be good role models without necessarily being all that relatable.

- The evaluation did not end up asking youth to describe STEM-related jobs that were a possibility for them after the sessions, as indicated in the objectives. However the pre-activity surveys indicated youth from both groups had difficulty naming STEM jobs in general, yet after the sessions they were generally able to describe information they learned about STEM jobs/careers from the role models. Also, the evaluation found that more youth indicated they were able to envision working in a STEM-related job after participating in a flash mentoring activity than did before participating in the activity (see Goal 2).

- Though the evaluation did not directly examine whether and how the youth shared their understandings of STEM and other careers with peers, those at YDI involved in creating the youth-produced videos had an opportunity to do this explicitly. Also, when youth were asked to estimate how likely they were to take specific actions within the next month as a result of participating in the flash mentoring session, in general, the youth in both the YDP and YDI groups indicated they would probably talk to someone (like a friend, family member, or teacher) about the role models they met in the session. While the YDP youth indicated they would probably talk to someone about something they learned from the session, the YDI youth were slightly less inclined to do so.

Goal 2: *At-risk Hispanic youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area.*

The corresponding objectives as outlined in the logic model, were largely met with YDP and YDI youth and primarily addressed in the flash mentoring activity:

- More youth indicated they were able to envision working in a STEM-related job after participating in a flash mentoring activity than did so before. While just one-third of the YDP youth said they could see working in a STEM field prior to the session, two-thirds felt they could see working in one of these fields after participating in session. Among the YDI youth, less than one-sixth of the group said they could see working in a STEM field prior to the session, while a slightly larger group, nearly one-fifth, said they could see this after the session; most of the remaining YDI youth left the question blank or said they were uncertain, as opposed to saying they couldn't see working in one of the fields.

- The objective of youth gaining a better understanding of what is involved in working towards a STEM job/career after participating in the activity was met with about half of the youth. Those who indicated that they felt they had a better understanding explained that they learned how STEM relates to their field of interest or that they learned of STEM's value in general. Those who felt they didn't gain a better understanding explained that they didn't like STEM or that their career didn't require it or there was a lot of information to process.

- Most youth said they *very much* or *totally* liked hearing the role models talk about their work and looked forward to meeting more role models because they wanted to learn about different jobs/careers or because they wanted to meet more cool or interesting people. The youth were consistently able to describe the most interesting things they learned from the role models they met, and as noted previously, they indicated that the role models participating in the program were good role models for themselves and their peers, and were able to explain why.

49

- The youth were not consistently questioned about the issue of which jobs/careers that they heard about during the activity stood out for them as most and least interesting, but they were asked about the aspects of the sessions that they most and least liked, to which they praised the opportunity to interact with the role models that visited and learn about different careers. Relatively few youth pointed to something they didn't like. Those who did generally cited time constraints.

- When the YDP youth were asked if the session caused them to think or feel about their future jobs/career in a new or different way, most confirmed that it did, for one of the following reasons: the session was motivating, the session caused them to reflect on their goals, or because they appreciated the role models messages of working hard and pursuing their dreams.

- Finally, when youth were asked to estimate how likely they were to take specific actions within the next month as a result of participating in the session, in general, the youth in both groups indicated they would probably talk to someone (like a friend, family member, or teacher) about the role models they met in the session and would look for more information about other jobs. While the YDP youth indicated they would probably talk to someone about something they learned from the session and look for more information about STEM jobs, the YDI youth were slightly less inclined to do so.

Goal 3: *At-risk Hispanic youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/ visioning directed art activities.*

Although the corresponding objectives, as outlined in the logic model, were not explicitly evaluated, similar indicators were addressed in the flash mentoring activity conducted with YDP and YDI youth:

- The evaluation did not specifically ask youth if they felt prepared for real-world interviewing sessions or whether they felt empowered as they asked role models standard interview questions. However, as noted under goal 2, youth indicated they felt empowered to take some next steps, including talking to others about aspects of the session and what they learned, and seeking information about STEM jobs. In addition, the youth had access to the role models who visited them and were willing to be contacted. Following up on the extent to which the youth did so was beyond the scope of *STEM Pathways*, but is something that would be looked at in future versions of the project. Additionally, most of the youth indicated that they were interested in meeting new role models in the future because they wanted to learn about different jobs/careers and/or because they wanted to meet more cool or interesting people.

- YDP youth tended to be neutral about whether their interviewing skills improved as a result of the session, while the YDI youth tended to agree that they did. Those who felt their skills improved most often elaborated that they weren't afraid or that they got good practice asking questions. Those who didn't feel their skills improved most often explained that they didn't have much opportunity to ask questions or that they were nervous.

Goal 4: *At-risk youth-produced social media about STEM careers will develop leadership & communication skills among at-risk Hispanic youth*

The corresponding objectives were generally met with YDP and YDI youth, although some aspects of the desired youth feedback has yet to be collected and analyzed:

- Youth participating in the various *STEM Pathways* activities indicated that they enjoyed the activities, learned about STEM or STEM jobs/careers, and developed further interest in STEM and STEM jobs.

- To assess the extent to which the youth-produced videos helped the participants develop their leadership and communication skills, a follow-up online survey was offered to and completed by five of the approximately eight YDI youth that participated in this program option, all of them young men. In general, the youth indicated that they learned about both STEM and STEM jobs, and that their communication and leadership skills improved through the researching, writing, interviewing, filming, communicating, experimenting, and video skills they learned and practiced. All five youth want to make more STEM videos in the future, and all but one said they *totally* enjoyed sharing the videos at a local screening. In general, their interest in STEM jobs increased after participating in the *STEM Pathways* program, and all expressed an interest in participating in more STEM-related programs in the future. Follow-up reports from supervising staff of YDI youth indicate youths' skills were developed or improved.

- The evaluation did not specifically address whether youth who watched videos could see STEM careers as more a likely possibility for them given the wide range of topics that the videos covered, but the youth largely agreed that the videos had high learning value. The majority of the youth felt they learned a *moderate* amount or *a lot* about STEM jobs/careers, and also about the education, training, or skills needed to obtain a STEM job/career. About half or more of the youth felt that the videos caused them to think about STEM in a new or different way. These youth most often described STEM as more fun, cool, interesting, prevalent, or lucrative than they previously realized. Those who felt the videos did not cause them to think or feel differently explained that they thought these subjects were boring or unappealing or that they didn't see that the videos had anything to do with STEM.

- With respect to the final objective of peer-to-peer learning opportunities supported through social media, youth in both groups tended to be neutral about whether they would share the videos with their friends or family members, although there were some differences of opinion about this issue. However, YDP youth tended to agree that the videos shown at the screening, or at least similar videos, could inspire their friends to learn more about STEM or STEM jobs/careers, and they also expressed interest in making similar videos in the future. The YDI youth tended to be neutral about both of these issues, which could be attributed to their experiences producing the videos shown at the screening.

- While youth in both groups tended to be neutral about whether they would like to see the same videos shown at the screening again, they largely agreed that they would like to watch more videos like them. About half of the youth in each group expressed interest in seeing more videos that feature youth interviewing STEM role models. YDP youth most often explained that the interviews were interesting, cool, or informed them about different jobs. YDI youth pointed to similar reasons, although a few youth also observed that they: enjoyed watching other youth, felt the process of interviewing was empowering to youth, and/or that they would enjoy being inspired by role models. Among the youth that weren't interested in seeing more videos of youth interviewing STEM role models, the YDI youth reflected that they found the videos boring, or that they already saw a lot of role models, likely referencing back to their involvement with role models in prior *STEM Pathways* activities. The YDP youth, who didn't have this experience, instead reflected that the types of jobs depicted in the videos weren't the type of jobs they aspired to.

- Finally youth in both groups indicated they would prefer to see videos like those shown at the screening in one of three places: on YouTube, at their own youth organization, or on Facebook. Where nearly three-quarters of the YDP youth indicated interest in watching the videos at school, only one-quarter of the YDI youth pointed to this option. Few youth in either group expressed interest in watching the videos at a friend's

house or on Tumblr, but as the youths' background information indicated in the report, access to social media varied among the youth, and while youth often reported using Facebook and YouTube, relatively few youth used Twitter, Instagram, or Tumblr.

Limitations

The evaluation findings reported here are based on surveys collected from youth who completed both pre- and post-activity surveys at the media, art, or flash mentoring role model session they attended as part of the *STEM Pathways* project. A number of limitations should be kept in mind when interpreting the findings, given the fast onset and pace of the programming schedule, the learning curve faced by the project team in coordinating with the YDP and YDI organizations and implementing the program activities, and the iterative and collaborative nature of the evaluation process which was limited in scope given that the project was a Pathway's grant.

First, it is unclear whether and how the youth that participated in the YDP and YDI programs were representative of the youth at each organization, although based on the available information, all of the youth in the YDP and YDI programs were given an opportunity to participate in the *STEM Pathways* project. As it was not feasible to examine this issue in depth as the project unfolded, it will be important for future versions of this project to document any selection criteria that the organizational staff, and the youth, use for participating in the *Pathways* activities and how this affects the number of youth ultimately reached and the extent to which these youth represent the population of youth served at each organization.

Similarly the *Pathway's* pilot was not set up to explore the youths' experiences in light of their involvement in different program types within YDI and YDP. For example, within YDI some activity sessions were held as part of the Gang Prevention and Intervention program and while others were held as part of the Amistad Youth Crisis Shelter. Moreover, within YDP, some sessions were held as part of the Day Reporting program while others were held as part of the Secure Lock-Up Facility. In future work, it will be important to more carefully document which activities are conducted with youth from different programs within each organization, and the influence this program type may have on their experience.

Second, an ongoing challenge that occurred in evaluating the sessions was that at least some participants within each YDP and YDI program participated in more than one *STEM Pathways* activity, such that a given YDI youth, for example, may have participated in an art activity as well as a role model activity. Because of the inconsistent nature of program participation, due to the legal system and transport availability, within both the YDI and YDP programs there were some repeat participants, but also many youth were new to *STEM Pathways* programs each session. With respect to those who attended more than one session, while the duration of the youth activities was fairly short, typically less than an hour or two in each case, the experience of completing one of the *STEM Pathway* activities may have influenced a given youth's experience of another activity, as well as their responses on the pre- and post-activity questionnaires. The *Pathway's* pilot was not set up to explore the added value of multiple versus stand-alone sessions but is a factor well worth exploring in future work.

Third, although the surveys were pilot tested and the youth indicated they generally understood the questions and were comfortable answering them in written form, incomplete surveys were encountered across the sessions for several reasons. First, completion was voluntary and the surveys were part of the regular educational activities being conducted during the sessions. Second, the project team member that administered the surveys did not consistently have the opportunity to remind youth of the importance of completing all of the questions, nor did s/he have time to look over the surveys for missed items. Third, the YDP youth occasionally had to leave an activity session to go to court and did not have an opportunity to complete post-survey questions.

These are all issues that would need to be addressed in implementing and evaluating future versions of the *STEM Pathways* project, appreciating that these are complications that come with programs engaging incarcerated youth in particular and that controlling these complications may limit external validity.

Looking ahead

As noted at the outset of this report, the *Pathways to Brighter Futures Through STEM Careers* project was an NSF-funded Pathways grant, and as such the project prioritized the "design, development, and testing" of components of the Division of Research and Learning (DRL)'s cycle of innovation, in general developing and testing innovative work to determine its viability as a model worth exploring more fully in a major AISL project (Research, Full-Scale Development, or Broad Implementation). Accordingly, the project's evaluation approach was designed to be collaborative and flexible, as well as ongoing and iterative. Despite the limitations this approach posed in systemically evaluating the project's impact, the evaluation's mixed method approach, combining detailed session documentation and pre- and post-activity surveys with youth and role models, did generate some evidence of the potential for the project to be impactful. The developing STEM *Pathways* model is worthy of further study and refinement, potentially through a research or focused full-scale development project, as there are tangible results that may be shared with youth and youth-serving organizations across the country and potentially internationally.

First, as evidenced in the in-depth evaluation findings, the *STEM Pathways* team members were able to develop programs and activities that appealed to a challenging and difficult-to-reach group of youth: Hispanic, at-risk, primarily male youth, many of whom are currently or had previously been incarcerated. The project team also successfully implemented the program in a secure facility for incarcerated youth serving two populations: incarcerated youth in a Day Reporting program, as well as youth living in the secure lock-up facility. Youth were engaged, enjoyed the interaction with role models, and felt that the program increased their understanding of possible STEM careers in their futures.

In addition, the program facilitated some youths' abilities to create their own media projects, which are products that can now be shared with youth nationally and internationally. These products include a series of youth-produced videos and radio PSA's about STEM careers that currently reside on a Tumblr website (http://pathwaystostem.tumblr.com). They were also broadcast by Hispanic Communications Network (HCN) on their 254-station radio network. Youth who were able to engage in this additional activity found the experience rewarding and leadership-building. One could also see the potential for impact on other youth who viewed these videos, as evaluation findings demonstrated.

There is sufficient evidence that this project has potential for replication. However, in its present form, it is extremely time-intensive and requires a great deal of work on the part of project staff, which may make it difficult to broadly replicate. There were efforts to interview the youth-serving partners in this phase, to determine whether they would have the infrastructure to assist with the program's implementation. Though nothing was confirmed, there was a sense that they might be able to do so. Thus, there is potential for a future research or focused full-scale development project that would refine the program, test its viability through partnerships with youth-serving organizations, and develop measures to assess its impact. The *STEM Pathways* team plans to build on this work through further development of the logic model, program activities, and evaluation strategies, so that the identified goals and objectives can be revised as needed, and ultimately achieved in an expanded effort.

References

Ahn, J. (2011) Digital divides and social network sites: Which students participate in social media? *Journal of Educational Computing Research*. 45(2): 147-163.

Arnett, J. and J. Jensen. (2000) Emerging adulthood: A theory of development from the late teens through the twenties. *American Psychologist*. 55(5): 469-480.

Au, K. H. (1980) Participant structures in a reading lesson with Hawaiian children: Analysis of a culturally appropriate instructional event. *Anthropology and Education Quarterly*. 11(2): 91-115.

Barker, V. (2009) Older adolescents' motivations for social network site use: The influence of gender, group identity, and collective self-esteem. *Cyber Psychology & Behavior*. 12(2): 209-13.

Benson, P. (2002) Adolescent development in social and community context: A program of research. *New Directions For Youth Development*. No. 95, Fall 2002: 123-147.

Butts, J.A., Bazemore, G. and A.S. Meroe. (2010) *Positive Youth Justice--Framing justice interventions using the concepts of Positive Youth Development*. Washington, DC: Coalition for Juvenile Justice.

Davidson, A.L. (1999) Negotiating social differences: Youth assessments of educator's strategies. *Urban Education*. 34(3): 338-369.

Deasy, R.J., ed. (2002) *Critical links, Learning in the arts and student academic and social development.* Washington, DC: Arts Education Partnership.

Fleitman, D.M. (2012) *Lights, camera, social action: Using video to engage youth and stakeholders* at Expanding Our Experience and Expertise: Implementing Effective Teenage Pregnancy Prevention Programs conference. Baltimore, MD. March 12, 2012.

Gittleman, J. (2007) *Learning in 3D: Arts and cultural programming in afterschool.* Boston, MA: The Massachusetts Special Commission on After School and Out of School Time Issue Brief.

Gushue, G.V. Clarke, C.P., Pantzer, K.M. and K.R.L. Scanlan. (2006) Self-efficacy, perceptions of barriers, vocational identity, and the career exploration behavior of Latino/a high school students. *Career Development Quarterly*. 54(4): 307-317.

Hahn, C. (2002a) *On the best of terms: Youth media defines itself and its problems*. New York, NY: Open Society Institute. March 2, 2002.

Hahn, C. (2002b) *Developing youth – and media, too*. New York, NY: Open Society Institute. December 10, 2002.

Halpren, R. (2005) Instrumental relationships: A potential relational model for inner-city youth programs. *Journal of Community Psychology.* 33(1): 11-20.

Heath, S.B., and E. Soep. (1998) Youth development and the arts in non-school hours. *Grantmakers in the Arts*. 9(1).

Heath, S.B., and A. Roach. (1999) Imaginative actuality, Learning in the arts during the non-school Hours. In E. B. Fiske (Ed.) *Champions of change: The impact of the arts on learning*. Washington, DC: Arts Education Partnership, President's Committee on the Arts and the Humanities.

Heath, S.B., and L. Smyth. (1999) ArtShow, Youth and community development. A resource guide. Washington, DC: Partners for Livable Communities.

Heath, S.B. (2000) Making learning work. *Afterschool Matters*. 1: 33-45.

Heath, S.B. (2012) Seeing our way into learning science in informal environments. In W. F. Tate (Ed.) *Research on schools, neighborhoods, and communities: Toward civic responsibility.* Published for the American Educational Research Association. New York: Rowman & Littlefield Publishers. 249-267.

Ito, M., Horst, H., Bittanti, M., Boyd, D., Herr-Stephenson, B., Lange, P.G., Pascoe, C.J. and L. Robinson. (2008) *Living and learning with new media: Summary of findings from the Digital Youth Project.* Chicago, IL. The MacArthur Foundation.

Jekielek, S., Kristin, S.M., Moore, A. and E.C. Hair. (2002) Mentoring: A Promising Strategy for Youth Development. *Child Trends*. Washington, D.C.

Linderman, A.J. (2010) Seventh Grade Student Career Aspirations and Academic Achievement. *Counselor Education Master's Theses.* Paper 67.

Lyon, G.H., Jafri, J., and K. St. Louis. (2012) Beyond the Pipeline: STEM Pathways for Youth Development, *Afterschool matters*, Fall.

MENTOR/National Mentoring Partnership. (2005) *How to Build a Successful Mentoring Program Using the Elements of Effective Practice*, MENTOR, http://www.mentoring.org/downloads/mentoring_413.pdf.

The National Evaluation and Technical Assistance Center for the Education of Children and Youth who are Neglected, Delinquent or At-Risk. *The Mentoring Toolkit: Resources for developing programs for incarcerated youth (Unabridged)*, http://www.neglected-delinquent.org/sites/default/files/docs/NDTAC_MentoringToolkit_Unabridged.pdf.

National Endowment for the Arts. (2002) *Creativity and youth: Enriching young lives through the arts.* Washington, DC.: National Endowment for the Arts.

Neelum, A., Villarruel, F., Villanueva, C. and I. Augarten. (2009) America's invisible children: Latino youth and the failure of justice. *Race and Ethnicity Series*. Washington, DC: Campaign for Youth Justice. 3: 1-91, http://www.campaignforyouthjustice.org/key-research/policy-briefs.html.

Oyserman, D. and S.A. Fryberg. (2006). The possible selves of diverse adolescents: Content and function across gender, race and national origin. In J. Kerpelman & C. Dunkel (Eds.) *Possible selves: Theory, research, and applications*. Huntington, NY: Nova. 17-39.

McCarty, G, Hope, J. and J.L. Polman. (2010) *The Youth Engagement with Science and Technology Survey: Informing Practice and Measuring Outcomes*, Paper Presented at NARST (National Association for Research on Science Teaching), 2010 Annual Meeting, Philadelphia, PA.

The Quality Education for Minorities (QEM) Network. (2010) *Hispanic Males in Stem*, Final Report, Spring 2010 Workshop on the Recruitment and Retention of Hispanic Male Students in Science, Technology, Engineering and Mathematics (STEM).

Tierney, J., Grossman, J. and N. Resch. (2000) *Making a Difference: An Impact Study of Big Brothers Big Sisters*. Retrieved October 24, 2008, http://www.bbbs.org/site/c.9iILI3NGKhK6F/b.5961035/k.A153/Big_impact8212proven_results.htm.

Yowell, C.M. (2002) *Dreams of the future: The pursuit of education and career possible selves among ninth grade Latino youth*. Applied Developmental Science. 6: 62-72.
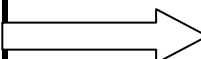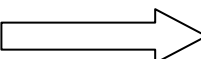
Watkins, C. (2009) *The young and the digital: What the migration to social network sites, games, and anytime, anywhere media means for our future.* Boston, MA: Beacon Press.

Zacharia, Z. and C. Barton. (2003) Urban middle-school students' attitudes toward a defined science. *Science Education.* 88(2): 1-27.

Logic Model *Pathways to Brighter Futures through STEM Careers*

Goal(s):

(1) At-risk Hispanic youth will increase their awareness and knowledge about STEM careers and the education, training, and skills needed to attain them.

(2) At-risk Hispanic youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area.

(3) At-risk Hispanic youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/visioning art directives.

(4) At-risk youth-produced social media about STEM careers will develop leadership & communication skills.

INPUTS	OUTPUTS		OUTCOMES		
What we invest	**ACTIVITIES**	**PARTICIPANTS**	**SHORT TERM**	**INTERMEDIATE TERM**	**LONG TERM**
Funding— $250,000 Pathways grant from NSF *HCN Project Personnel—* One (1) full-time and eight (8) part-time staff and paid consultants and advisors	*What we do* Four (4) Listening sessions Five (5) art directive career visioning activities at each site with each youth group;	*Whom we reach* Approximately two-hundred (200) at-risk and incarcerated Hispanic youth ages 12-22, 75% male, in Albuquerque and Santa Fe New Mexico.	*What the short term results are* **At-risk Hispanic youth will enhance career awareness in general & understanding of STEM careers specifically**	*What the long term results are* **At-risk Hispanic youth will continue to pursue learning about STEM careers**	*What the ultimate impact(s) are* **At-risk Hispanic youth will be successful pursuing a STEM career; the juvenile justice system will see that *Pathways to Brighter Futures through STEM Careers* is a viable model for incarcerated youth.**

			OUTCOME MEASURES		
Partner Organizations & Sites— ¡YouthWorks! (YW); SF Youth Development, Inc (YDI); Abq Youth Development Program (YDP); SF New Mexico Children, Youth & Families Department (CYFD) Foothills High School

Time— Approximately Twenty-two (22) 1.5 hour events at each site

Equipment— Materials for art directive career visioning; Snacks/food at most events Role model bios Sample questions to ask | Nine (9) Interactive activities with role models sessions with 3-6 role models (ideally bringing relevant item that offers an opportunity to see an authentic object from the workplace and in some cases, a "hands-on" STEM learning experience)

Seven (7) social media creation sessions with YDI volunteer youth

Two (2) screenings of youth-made media products

Disseminate two (2)-page Primer on STEM Jobs in NM to youth | Approximately thirty-five (35) STEM role models | ▪ Youth will indicate that they enjoy doing the [*art, role model*] activities and be able to describe what they most enjoy
▪ Youth will report they are comfortable doing the activities [*art activity*: sharing and discussing what they made, *role model activity*: asking the professionals' questions and participating in discussions]
▪ Youth will indicate they enjoy meeting the professional role *models and be* able to describe what they most like ab*out meetin*g *them*
▪ *Role model activity only*: Youth will indicate that they enjoy hearing the professional role models talk about their work
▪ *Role model activity only:* Youth will indicate they enjoy watching the professional role model demonstrations
▪ *Role model activity only*: | ▪ Youth follow up with role models through business cards
▪ Youth will express more interest in science careers
▪ Youth will be more likely to talk with their friends/families about activities and new ideas
▪ Youth will be more likely to ask potential role models questions
▪ Youth still involved in voluntary programs will return to additional sessions; youth in lock-up facilities will participate fully & enthusiastically; youth will seek out additional information about STEM careers
▪ Youth will share how STEM practices can be | ▪ Youth will be pursuing education/trai ning for a STEM career
▪ Some youth will be working in STEM careers
▪ Organizations will seek out this program for their youth. |

role models Resource list for future STEM/green job/educational opportunities *Role Models*—Thirty-five (35) voluntary role models from NM STEM professions	and partner organizations. Four (4) broadcast-quality radio PSA's featuring youth-produced interviews about STEM career interest.		Youth will indicate that they can relate to the professional role models ▪ Youth will be able to describe 2-3 types of technical STEM-related jobs that are a possibility for them, currently and in the future; Youth will share understandings of careers in general, and STEM careers specifically in their own words with peers **Youth will understand that working in a STEM-related job is a possibility for them, currently, and in the future, and will have contacts, information and strategies for further learning in this area** ▪ Youth will share enthusiasm that working in a STEM-related job is a possibility for themselves & others; ▪ *Role model activity only:* Youth will indicate that they have a better understanding of what is involved in working	applied to solve/mitigate/ improve the quality of life in a community **By using the resources from this project, youth will understand that they can work in such a job and will know what specific education and skills they need.** ▪ Youth will indicate that, as a result of participating in the activity, working in a science job/career is a possibility for them in the future and be able to explain why this is the case.	**Youth will be successful in beginning to pursue a STEM career; the juvenile justice system will see that *Pathways to Brighter Futures through STEM Careers* is a viable model for incarcerated youth.** ▪ Youth will demonstrate the ability to pursue a STEM career.

| | | | towards a science job/career after participating in the activity and be able to explain why
- *Role model activity only*: Youth will be able to describe the most interesting things they learn from the professionals they meet
- *Role model activity only:* Youth will indicate that the professionals participating in the program are good role models for themselves and their peers, and be able to explain why this is the case
- *Role model activity only*: Youth will be able to identify which of the jobs/careers they hear about during the activity stand out for them as most and least interesting, and explain why

Youth will develop self-confidence, and further develop their educational and career goals through interviewing activities with role models and goal/visioning art directives. | **Youth will demonstrate their self-confidence by contacting a role model to get further information**

- Youth will indicate they are interested in doing more activities [*art, role model*] in the future and be able to explain why
- *Role model activity only*: Youth will indicate that the activity causes them to think or feel about their future jobs/career in a new or different way and explain why

Youth-produced social media about STEM careers demonstrate leadership & communication skills

- Youth are proud of media products and share with | **Youth will be self-confident as they pursue STEM education and careers.**

Youth-produced media is used in future programs and nationally broadcast to help new participants see STEM jobs as likely possibilities for them.

- Youth-produced media inspires non-participants in program toward STEM jobs |

				other peers and parents	
			▪ Youth are prepared for real-world interviewing sessions and empowered as they ask role models standard interview questions ▪ Youth will know at least one contact person who works in a STEM-related career with whom they can follow up ▪ *Role model activity only*: Youth will indicate that their interviewing skills improve as a result of participating in the activity and be able to explain why this is the case **Youth-produced social media about STEM careers will develop leadership & communication skills** ▪ Youth develop further interest in STEM jobs ▪ Youth develop media skills supporting leadership and communication skills development ▪ Youth who watch videos are inspired and see STEM careers as		

			more likely possibility for them supports peer to peer learning opportunities		
			Youth-produced audio interviews about STEM careers will be broadcast on 254 Spanish language stations reaching over 13 million parents of Hispanic youth • Parents are inspired to support their children's interest in STEM careers		