UMASS DONAHUE INSTITUTE • APPLIED RESEARCH & PROGRAM EVALUATION

Massachusetts STEM Pipeline Fund

2015 Qualitative Study of the Regional STEM Networks

Presented to the Massachusetts Department of Higher Education

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Acknowledgements

The University of Massachusetts Donahue Institute staff would like to thank the people who invested their time and energy to be interviewed for this study, including staff from the Department of Higher Education, the STEM Regional Network managers, and additional Network leaders. Their time, cooperation, and thoughtful reflections on important and timely questions were greatly appreciated.

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Executive Summary

Since 2004, the UMass Donahue Institute (UMDI) has provided a range of qualitative and quantitative evaluation, research, and technical assistance services to the STEM Pipeline Fund. As part of its FY15 contract, DHE engaged UMDI to conduct a qualitative study of the Networks. Through a collaborative process, DHE and UMDI articulated the following core research questions that drive the study in support of the above goals.

Research Question 1: As currently configured, what are the Regional STEM Networks doing in terms of (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events?

Research Question 2: How effective are the Regional STEM Networks at (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events? What are the supports and challenges to Networks' effectiveness?

Research Question 3: What, if any, statewide mechanisms might enhance individual Regional STEM Networks' effectiveness, and/or facilitate the scale up of effective practices? What should statewide support look like?

The study was conducted between March and July 2015. There were two overarching purposes of the study: (a) to understand the breadth and depth of activities initiated by the Networks, or occurring under the umbrella of the Networks, and (b) to understand what might contribute to the success of the Networks going forward.

The 2015 Regional STEM Network Study used a qualitative approach to gathering data with four components:

1) Network Manager Interviews
2) Key Stakeholder Interviews
3) Network Manager Focus Group
4) Interview of DHE staff

Individual interviews and the focus group were coded and summarized by research question. Patterns and anomalies across interviews were identified and explored through an iterative process, such that emergent findings were explored in the course of ongoing data collection.

The interviews and focus group surfaced four main findings with regard to Research Question I: what the Regional STEM Networks are currently doing in terms of stimulating awareness and interest among key populations, and organizing, building, and supporting outreach events.

Finding I: There is significant convergence between the Networks' view of their roles and duties and that of DHE. At the forefront for both DHE and Network representatives was that the Networks fulfill a substantial role as conveners and disseminators of information. For both DHE and Network representatives, the Networks' role in bringing people together through a range of activities (including meetings, outreach activities, and, in some cases, projects) was strongly emphasized.

Finding II: The Networks are conveners. Holding meetings was something that was brought up as important in all the interviews. Members expect to make contacts that will further their own STEM projects and goals.

Finding III: The Networks communicate information. In addition to convening, the Regional STEM Networks fulfill an important information sharing and distribution role. In some regions, they are viewed as a one-stop "clearinghouse" or the "go-to organization" for STEM information, including information regarding who is doing what in the region, who might be able to help whom with regard to a problem, and what the state is doing to promote STEM.

Finding IV: The Networks inspire grassroots activities. Associated with the Networks' role as convener and disseminator of information is their inspiration and support of local-level, grassroots events and activities run by other organizations in their communities.

The interviews and focus group surfaced five main findings with regard to Research Question II: examples of work that is perceived to be effective and the criteria by which DHE and the Networks understand effectiveness.

Finding V: The Networks' greatest value appears to lie in their ability to connect STEM stakeholders, share information and spur grassroots activity, including successful grant-seeking efforts. A common theme among all the interviews was that the Networks are recognized as making valuable contributions within their respective communities.

Finding VI: The strongest participation in the Networks is by K–12 and higher education. This is in alignment with the emphasis of the Statewide STEM Goals in which four of the five goals are education focused.

Finding VII: Business is viewed as a critical component in advancing STEM agendas and is the most challenging sector for Network engagement.

Finding VIII: The Networks still have under-tapped populations. Several under-tapped populations exist that might be integrated into the Networks. These include professional associations, student associations, early education, out-of-school time, private/parochial schools, and underrepresented minorities

Finding IX: Some Networks are seeing longer-term effects of their work. This includes institutionalization of network and member relationships as well as seeing Pipeline efforts come full circle as former student participants become members who have joined STEM professions.

The interviews and focus group surfaced five main findings with regard to statewide support.

Finding X: Branding and messaging to enhance public understanding that the Networks share a common purpose and support a unified agenda was important. A common theme among the Network managers that there is a role for the state in consolidating the branding and messaging associated with STEM, the Pipeline Fund, the Regional Networks, and the STEM Advisory Board.

Finding XI: The state could facilitate centralization and coordination of communication. Interviewees suggested that the state could play a greater role in centralizing and coordinating communication related to the Networks in two ways: (1) among the Networks, and (2) for the Networks.

Finding XII: The state could distill and communicate best practices. As best-practice projects are identified, their information would be captured by the regional Network in which they are located. The regional Networks would then communicate this information to the state which would either (a) facilitate its being shared among the regional Network managers, and/or (b) synthesize and pass the information on to a relevant statewide organization or department.

Finding XIII: The state could highlight models of engagement among businesses/organizations that represent best practices in terms of involvement with the Networks or the MA STEM Council. The study suggests that the

state could help provide role models for business engagement in the Networks at the state level, and at the regional level.

Finding XIV: The state should retain the Pipeline Fund senior program manager position. Interviews revealed a strong consensus among all the managers concerning the value that the role of Pipeline Fund senior program manager brings to the system of regional Networks.

Persistent challenges faced by all the Networks, regardless of their maturity or resource base, included (1) integrating business into Network management and activities; (2) accommodating turnover among members that results from a membership life-cycle of joining-participating-leaving; (3) reacting to turnover at participating organizations above and beyond that of the specific network representative (e.g., a change in the representative's supervisor or HR regulations regarding volunteer time) that results in changes to contacts and relationships; (4) messaging about the networks' purpose, branding of the networks' identity, and legitimatization of the networks' relationship to the state; and (5) addressing diversity among both members and program participants.

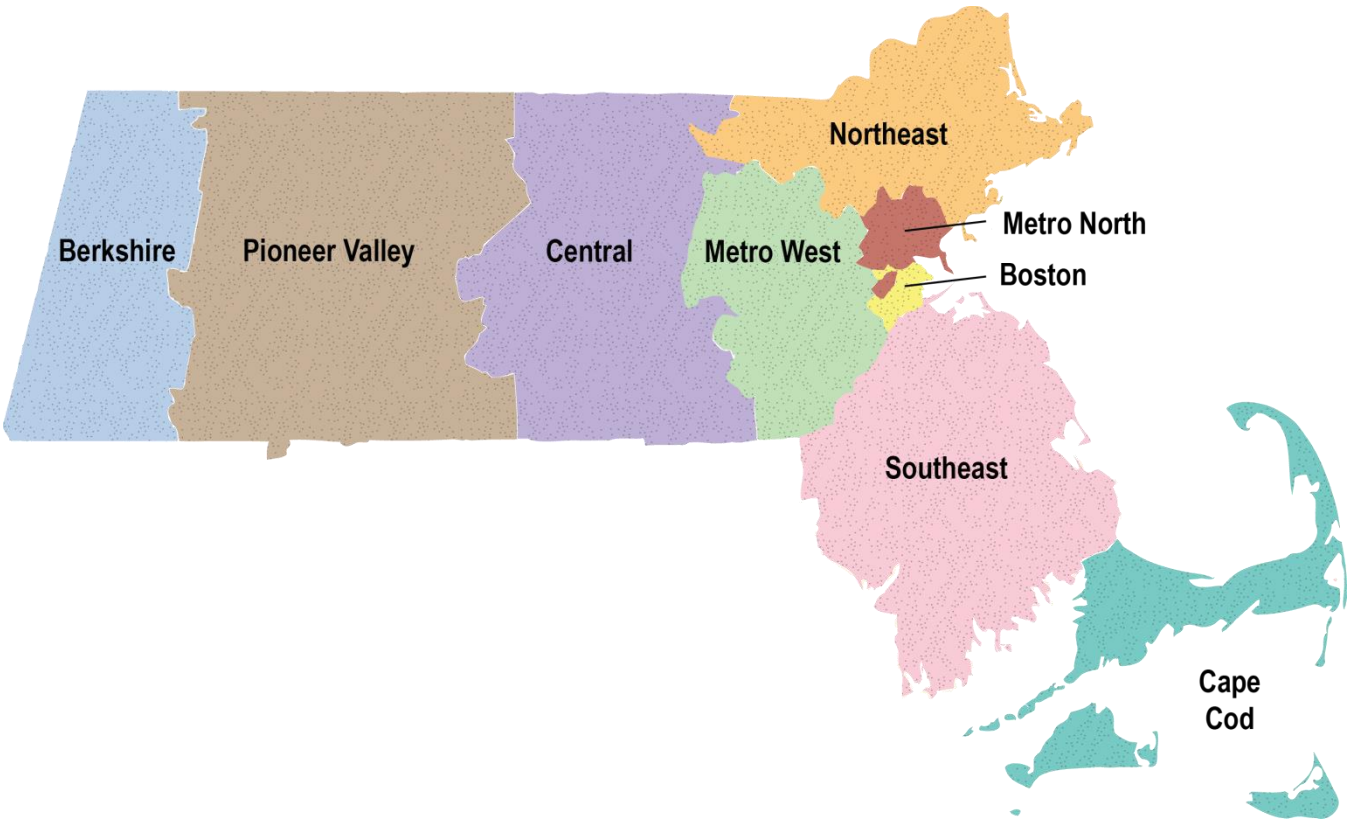
Overall, the study suggests that the STEM Regional Networks have effectively fulfilled important roles in developing the state's STEM landscape in multiple ways. While these roles may continue to evolve, the networks can strongly contribute the ongoing work associated with the state's STEM agenda (see the Commonwealth's State STEM Plan 2.0 at http://www.mass.edu/stem/documents/2013-11MassachusettsSTEMPlan2.0.pdf).

Introduction

The Commonwealth's Science, Technology Engineering, and Mathematics (STEM) Pipeline Fund was established in 2004 with three purposes:

- Increase the number of Massachusetts students who prepare for and enter STEM careers,
- Increase the number of qualified STEM teachers in the Commonwealth, and
- Improve the STEM educational offerings

As a means of fulfilling these purposes, in 2004, the MA Department of Higher Education (DHE) created a system of "Regional STEM Networks" (henceforth referred to simply as Networks) that would bring together stakeholders from multiple sectors ranging from early education through industry. The Networks' goals are to (a) address STEM issues of importance within their geographic area, and (b) connect local efforts to statewide initiatives. The system of Networks has evolved over time in terms of geographic coverage. The current system comprises nine Networks whose territories are shown in the picture below:



At their founding, two forms of funding were available to the Networks: (1) administrative funding for the operation of the Network, and (2) project funding for the Networks to implement initiatives involving students or teachers. As a result of a series of budget cuts, funding was reduced in subsequent years as follows: (1) administrative funding was reduced from $100,000 annually to $40,000 annually, and (2) project funding was eliminated.

Overview of the Study: Goals and Research Questions

Since 2004, the UMass Donahue Institute (UMDI) has provided a range of qualitative and quantitative evaluation, research, and technical assistance services to the STEM Pipeline Fund. As part of its FY15 contract, DHE engaged UMDI to conduct a qualitative study of the Networks. The goals of this study were fourfold:

1. To understand the role and duties associated with the Regional STEM Networks;
2. To understand what is, and is not, working regarding the building of STEM interest and awareness by the Regional STEM Networks;
3. To understand the ability of individual Networks to serve as grassroots coordinators of events and attract new audiences; and,
4. To understand what a potential "next generation" model of the Regional STEM Networks might look like.

Through a collaborative process, DHE and UMDI articulated the following core research questions that drive the study in support of the above goals.

Research Question 1: As currently configured, what are the Regional STEM Networks doing in terms of (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events?

Research Question 2: How effective are the Regional STEM Networks at (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events? What are the supports and challenges to Networks' effectiveness?

Research Question 3: What, if any, statewide mechanisms might enhance individual Regional STEM Networks' effectiveness, and/or facilitate the scale up of effective practices? What should statewide support look like?

Overview of the Report

This report presents key findings of a qualitative study conducted from March through July 2015. Through interviews and a focus group, the study explored the perspectives of Network managers, selected additional leaders, and DHE staff. These are further described in the Methodology section. Interview protocols and a focus group guide are included in the appendices.

Key findings are presented in the Findings section, organized by research question.

The Conclusion section offers reflections on cross-cutting themes evident across research questions and respondents, and highlights areas for potential consideration as the Commonwealth continues to advance its STEM agenda.

Methodology

Interview and focus group methodology was used to address the study's two overarching purposes : to understand (a)the breadth and depth of activities initiated by the Networks, or occurring under the umbrella of the Networks, and (b) factors that may contribute to the success of the Networks going forward.

Data Collection

Semi-structured interviews were conducted with Network Managers, other non-staff Network leaders, and staff of the Department of Higher Education. Semi-structured protocols were designed for systematic investigation of the research questions and allowed for consideration of unanticipated topics that were also relevant to the evaluation (Appendices A-C).

Semi-structured Interviews

1) **Network Manager Interviews:** Nine individual interviews were conducted by telephone from month? through month? and lasted approximately 60 minutes each. These interviews explored all three research questions.

2) **Key Stakeholder Interviews:** UMDI staff worked with the Network managers to identify additional leaders who would be interviewed, seeking individuals who had significant depth and longevity of experience with a network to speak to the effects of that network's efforts. These individual interviews were conducted by telephone during April 2015 and lasted approximately 45 minutes each Initially, the plan was to interview 12 additional leaders. However, one became unavailable, so only 11 were interviewed for the study. These interviews focused on Research Questions 1 and 2.

3) **Interview of DHE staff:** A joint interview with two DHE staff related to the Regional STEM Networks was conducted in April 2015?. This interview explored all three research questions, was conducted via telephone and lasted approximately 60 minutes.

Additionally, one focus group was conducted with Network managers.

Network Managers Focus Group

A focus group was conducted in person (one Manager participated by telephone) in the middle of the April 2015 Regional STEM Network managers meeting, and lasted approximately 60 minutes. The purpose of the focus group was to explore themes that emerged from the individual interviews with Network Managers and key stakeholders, across all three research questions. Conceived as a facilitated large-group discussion, the focus group methodology allows participants to respond to questions or statements posed by a facilitator, but unlike an individual interview, each participant is not expected to respond to each question. Rather, the group discussion encourages questions and comments between participants, thereby confirming, challenging or deepening researchers' and participants' understanding of emerging themes, while also encouraging new observations and reflections.

Data Analysis

Interviews and the focus group were audio recorded with participants' verbal consent. Interview and focus group data were summarized and the summaries were coded by research question. Patterns and anomalies across interviews were identified and explored through an iterative process, such that emergent findings were explored in the course of ongoing data collection. A second member of the research team reviewed interview data and summaries to subject the findings to challenges and questions. QSR NVivo10 software was used to manage and analyze the data.

Confidentiality

UMDI retains sole ownership of the audio files, which, like all documents prepared under this study, are stored on the Institute's server. Audio files will be deleted at the conclusion of the study. Most findings are reported in the aggregate, and the researchers have endeavored to protect individual speaker's identities. Given that the sample is small and participants enjoy a high degree of familiarity within their groups, it is, however, reasonable to expect that some findings may be associated with Networks and/or their representatives.

Limitations of the Study

Qualitative inquiry such as this study generates context-dependent knowledge, such that findings are not assumed to be widely generalizable. Rather, the reflections and insights offered by study participants reflect specific conditions relative to Networks' geography, history and other factors. Attention to context is warranted if the study's findings are considered for broader application.

Findings

This section presents major findings of the study organized by research question. The first set of findings is related to Research Question I and examines what the Regional STEM Networks are currently doing generally. The second set of findings is related to Research Question II and explores perceptions of the Regional STEM Networks' effectiveness. Finally, the last set of findings is related to Research Question III and considers what Network managers envision as possible or productive for a "next generation" system of networks.

Research Question I – As currently configured, what are the Regional STEM Networks doing in terms of (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events?

While the original research question drew a distinction between stimulating awareness and interest among key populations and outreach events, interviews suggested that the Network representatives actually do not perceive such a clear distinction with respect to their work. Rather, they describe considerable overlap between the two, largely considering the outreach events to stimulate awareness and interest. In this light, the two areas are discussed together in the section below.

The interviews and focus group surfaced four main findings with regard to what the Regional STEM Networks are currently doing in terms of stimulating awareness and interest among key populations, and organizing, building, and supporting outreach events.

Finding I: There is significant convergence between the Networks' view of their roles and duties and that of DHE.

At the forefront for both DHE and Network representatives was that the Networks fulfill a substantial role as conveners and disseminators of information. For both DHE and Network representatives, the Networks' role in bringing people together through a range of activities (including meetings, outreach activities, and, in some cases, projects) was strongly emphasized. DHE described, for example, Networks' role in serving as the local conveners for the State STEM Plan within their regions and their role in providing STEM-related information to local and regional stakeholders. The Networks, similarly, described a range of efforts to serve as connectors between STEM-interested individuals and organizations. All the Regional STEM Networks engaged in a variety of activities to stimulate awareness and interest among key populations.

Finding II: The Networks are conveners.

Holding meetings was something that was brought up in all the interviews. As stated by one interviewee: "The Network holds regional meetings on a regular basis. They help increase collaborative awareness of opportunities and access to resources." The nature of the meetings varied widely, even when limited to the four quarterly meetings the Networks are required to hold by DHE. Some were large (40 people or more) and open to all who wished to come; these were seen as recruiting opportunities. According to one interviewee, "Quarterly meetings are held at interesting places that draw lots of local people." Others were small (10 or fewer) and closed for a select group of members; these were seen as administrative or strategic planning sessions. Most were a mix of these characteristics, hosting meetings that had one part that was information oriented and one part that was planning oriented.

In addition to their quarterly meetings, most of the Networks ran additional kinds of specialty meetings. The most common of these was the meeting of an executive committee or leadership group of some type. This was a small, core set of dedicated members whose role was to make decisions about the Networks' priorities and direction. Less common (present in three of the Networks) were subcommittees attached to the Advisory Board or executive committee that engaged in specialized work. In at least two of these cases, certain subcommittees had a substantial number of members involved (over 10 each).

Public events run by Networks were activities that were open to the public above and beyond the Network's general distribution list. These were organized by five of the nine Networks. In three of these cases, the events were held in conjunction with an event run by another organization (e.g., running an expo or fair at one of the regional State Science and Engineering Fairs). In two of these cases the events were run independently of other groups or activities.

One specific aspect of convening relates to Networks' "signature events." DHE representatives described an additional, "unofficial" expectation (i.e., something that has been encouraged at meetings but is not currently part of the Networks' contracts) in that Networks would hold a large, annual signature event. DHE's vision was that through such an event, Networks would achieve the following objectives:

A. The Network becomes known as a connector.
B. The region is united.
C. There is a focus on Network activity.
D. One or more of the State STEM Goals is advanced.
E. The Network's efforts are solidified.

As noted above, running projects is no longer an expectation of the Networks due to their reduced funding. However, some Networks are still able to allocate a small amount of money to support low-cost initiatives, raise money from outside sources to support larger initiatives, and/or receive money through different grants from the MA Department of Higher Education that are targeted at specific initiatives (e.g., @Scale projects). Successful signature events in DHE's view would (1) engage the entire membership, (2) draw 30 or more people to meetings, (3) give people a part in the activity (about which they could talk at meetings), (4) bring different stakeholders together for one purpose, (5) have a large turnout at the event itself, (6) rally the Network to the STEM Plan and Goals, and (7) resonate over time.

Some Networks run a large signature event while others organize a set of small to medium events, still accomplishing DHE's objectives. One example of a large signature event is one Network's "Innovation Month" that has been run annually for several years. The event engages a wide segment of the Network's membership across multiple sectors for the purpose of organizing visits by STEM professionals to the school district such that every 7th grader in the district participates in a visit. The event is designed specifically to address the State STEM Goal related to increasing student interest in STEM. The event has existed long enough that relationships between individual schools and the businesses/organizations that provide their volunteer professionals have become institutionalized. The event occurs at the same time every year so everyone can plan ahead for it. One interviewee said the process runs "like clockwork." Examples of alternative efforts into which Networks put their efforts include publishing a webzine and organizing a standardized evaluation project among out-of-school time agencies. Most of the Networks coordinate something that is above and beyond their required quarterly meetings.

Finding III: The Networks communicate information.

In addition to convening, the Regional STEM Networks fulfill an important information sharing and distribution role. In some regions, they are viewed as a one-stop "clearinghouse" or the "go-to organization" for STEM information, including information regarding who is doing what in the region, who might be able to help whom

with regard to a problem, and what the state is doing to promote STEM. All the Networks engage in a variety of communication with a wide range of stakeholders, and the role of communicator is seen by stakeholders to be a central role of the Networks. According to one interviewee: "The Network is good at sharing information: they share other people's outreach activities as well as needs." According to another, the Network is a "facilitator of information." A third interviewee stated that the Networks "broaden knowledge of STEM opportunities." The means by which the Networks perform this function ranges from paper flyers handed out at meetings to a full webzine. Content includes opportunities for students, professional development for teachers, information about STEM career pathways, and general news about STEM and events.

The people with whom the Networks communicate vary by individual institution In education, for example, some Networks' main contact is as the school level (a teacher or a curriculum coordinator), while others work most closely at the district level (e.g., the superintendent's office). Similarly, in the business realm, some networks rely on the human resources department while others collaborate closely with a working professional. Discovering who the appropriate contact is for an organization reportedly takes a great deal of time and can be a distinct challenge for Network expansion. This is an ongoing problem in that member (specific network representatives) and organizational (the companies for which representatives work) turnover lead to needing to reestablish relationships anew. For this reason, some interviewees identified the engagement of a full-time manager as important. Currently, Networks only have part-time managers who have to balance multiple other projects with their Network responsibilities. As a result, they find that making the investment of time required for the development of new relationships can be difficult.

Additional areas of convergence between DHE and the Networks' view of their roles and duties

In addition to convening and sharing information, DHE representatives described Networks' roles in terms of administration and advocacy. They noted that Networks fulfill administrative responsibilities such as holding meetings and meeting state reporting requirements. In terms of advocacy, they noted that Networks serve as the local advocate for the State STEM Plan within their regions, as well as for STEM generally.

In the interest of efficiency, administrative functions of the Networks were not discussed as part of the interviews because this was an area in which all the Networks have reportedly performed well.

With respect to advocating for the State STEM Plan, Network representatives tended to describe their work more in terms of communication rather than advocacy, and the degree to which Networks engaged in this varied considerably. For some Networks, the Plan and Goals were mentioned as something that underlay the development of their activities. For one, the Goals were actively used at the beginning of meetings to help stakeholders see how they are already contributing to the STEM agenda. This will be discussed more under Research Question 3 (p. 15), suggesting that closer collaboration between DHE and the Networks may be an area for further consideration.

Finding IV: The Networks inspire grassroots activities.

Associated with the Networks' role as convener and disseminator of information is their inspiration and support of local-level, grassroots events and activities run by other organizations in their communities. According to one interviewee "The purpose of the Network is to facilitate grassroots involvement." According to another, "The [Networks] help make grassroots generated events more successful." Some of these events/activities are direct replications of something being done at the regional level by a Network. Other events/activities are unique to their location.

Grassroots activities are ones that are based in a single community: they are a gathering of local stakeholders who seek to address a highly localized need. While this localized need may overlap with region-wide ones (e.g., the

need to inspire more interest in STEM), grassroots activities are focused on a limited geographic area and population. The benefit of activities generated at the grassroots level is that organizers are much more aware of resources and constraints within the community. Activities can be grounded in what is familiar and meaningful to participants while at the same time acknowledging what participants need in terms of exposure in order to grow. An example of this is local STEM Expos, where organizers engage STEM-related adults from the immediate community while at the same time bringing in "outside examples" to introduce students to what else they might do. Grassroots activities also have the potential for drawing together community members who might not feel able or comfortable participating at a regional level. This is especially true for small businesses for which sponsorship of a regional activity would be too expensive, but the sponsoring of one or two students to do something locally is reasonable.

Grassroots activities develop in one of three ways: (1) a local stakeholder comes up with an idea and reaches out to other local people to help support it, (2) a local stakeholder comes up with an idea and then seeks out the Network to help with the development of that idea, or (3) A member of the Network who has participated in a regional activity looks to replicate, or create a variation on, that activity in their home community so that more local students/people can participate. While the first of these ways occurs beyond the scope of the Network, it is still important as it is evidence of the culture of increasing STEM knowledge in which the Networks operate. Also, some of the people who organize these independent activities do reportedly find their way to the Network eventually, either to improve their activity or to connect to others at a regional level.

In the case of one Network which requires communities to develop STEM teams in order to participate in regional activities, study participants reported side effect of increased community knowledge. That is, STEM involvement is associated with increased knowledge that participants have about one another. In the case of another Network, this type of increased knowledge, at least at a regional level, has led directly to more collaborative projects and even successfully funded National Science Foundation proposals.

Summary: In a context of a changing landscape and revised funding formulas, Networks demonstrate continued progress in spreading the word to key stakeholders within their regions.

All the Network managers, some of the additional stakeholders (those with longer involvement in the Networks), and the DHE staff commented on how both the Networks themselves and the landscape in which they operate have changed since the Networks were first founded 10 years ago. With regard to the landscape, one manager commented during the focus group that there is a "palpable sense that people get it" now, compared to the beginning years—that the Networks have had added value in contributing to community members' general awareness of STEM as an issue. In the words of another interviewee: "There is well-developed awareness of STEM in the Region, especially at the K–12 level." In fact, some Networks reported that they are seeing some backlash against the STEM movement—that some individuals react strongly when the STEM agenda is talked about—and that this is evidence of successful advancement of a STEM agenda. In other Networks, interviewees reported seeing calls for a "STEAM" agenda (science, technology, engineering, arts, and mathematics), which was interpreted as meaning that the STEM agenda has been seen as successful and people who are advocates of other subject areas want to join in.

A major factor for changing the nature of the Networks themselves has been their funding formulation. As noted above, when the Networks were founded they had more money with which to conduct Network-building activities, and access to a separate stream of funding for the support of projects. Several Network managers commented that project work helped give a focus to meetings and draw in stakeholders. In addition, the kind of outreach activities in which the Networks engaged in at that time demanded more resources (especially in the form of a full-time manager) than simply maintaining relationships

All the Networks serve as conveners, generators of grassroots activity, and coordinators of communication, and these activities are in line with both the Network managers' and DHE's view of the current role of the Networks. To a large degree, all these activities overlap and interrelate: In serving as conveners, Networks bring together interested stakeholders who then partner to implement grassroots events. In serving as generators of grassroots activity, Networks inspire projects about which there is a need to communicate. And in coordinating communication about these projects, Networks bring stakeholders together. While responsive to their local conditions and engaged in a variety of efforts, Networks overall demonstrate a commonality of purpose and shared sense of moving the statewide agenda forward.

Research Question II – How effective are the Regional STEM Networks at (a) stimulating awareness and interest among key populations, and (b) organizing, building, and supporting outreach events? What are the supports and barriers to Network effectiveness?

In this section, examples of work that is perceived to be effective and the criteria by which DHE and the Networks understand effectiveness are discussed. The section is organized around five main findings.[1]

Finding V: The Networks' greatest value appears to lie in their ability to connect STEM stakeholders, share information and spur grassroots activity, including successful grant-seeking efforts.

A common theme among all the interviews was that the Networks are recognized to make valuable contributions within their respective communities. The contacts members gain through meetings are widely acknowledged to be irreplaceable. Notably, many of the Networks are now mature enough that members have come to rely on one another: they have developed a local community of practice based on shared experiences and expectations. Because of the Networks, stakeholders no longer need to "begin from the beginning," as one interviewee described, with regard to developing common projects because the threshold of initial familiarity has already been crossed. While the type and format of convening varied across the Networks, it was generally agreed on by interviewees that having physical meetings was important. One Network ran regional meetings based on a career fair model. The purpose of these was to draw in people who might think the distance to a regular Advisory Board meeting was too great to travel. An interviewee described the nature of their quarterly meetings as follows: "The Network is a place to have conversations with like-minded people. There is no other place to do this. The quarterly meetings provide opportunities for information sharing, networking and meeting people, development of partnerships." An interviewee from another Network said, "The role of the Network is a convening team, something to get the right voices to the table, something to draw together the right audiences." A third interviewee commented, "The Network is the backbone of initiatives—a structured foundation upon which everything can take place. It helps to decrease redundancies among grassroots projects. Having a holistic group at the table decreases lack of knowledge."

Interviewees valued quarterly meetings as a place to connect with others who are highly involved with STEM issues and programs. One interviewee said, "Personally I haven't walked away from a meeting without a contact that hasn't benefitted [my institution]." In the words of another, "Having a single point for several contacts is priceless. The personal networking is invaluable." In some cases, these connections were long-standing, almost institutionalized relationships among people who had worked together for many years (especially among the more mature Networks). In other cases, these connections were developing relationships among people who were new to the Networks (especially among the younger Networks).

Generally, meetings were seen as effective, usually based on the number of people who attended them. Looking at other qualities, an interviewee said effective meetings "give people a purpose to be involved (authentic involvement) and are a place where ideas are respected and heard." Another interviewee defined successful meetings as having the following attributes:

A. Very good communication.
B. Long lead time for scheduling.
C. Distribution of minutes.
D. Their occurrence and operation are almost like clockwork.

[1] As described above (p. 5), the original research design drew a distinction between stimulating awareness and interest among key populations, and outreach events, but interviews suggested that the Network representatives actually do not perceive such a clear distinction with respect to their work. In this light, the two areas are discussed together in the section below.

E. You know ahead of time what the meeting will be about.
F. Breadth of membership.

The perceived success of additional meetings depended on their purpose. Executive or leadership committees were seen as successful if the members were engaged and action oriented. Subcommittees were seen as successful if they engaged in some kind of work with a clear outcome (e.g., implementation of a project, coordination of an event, etc.). Lastly, regional meetings were seen as successful if they drew people who hadn't attended an Advisory Board meeting. According to interviewee accounts, these additional meetings were a mix of successful and unsuccessful, sometimes even when implemented within the same Network. In cases where additional meetings were either unsuccessful or unproductive, Networks responded by altering the format of the meeting, replacing the meeting with one focused on a different issue, or simply dropping the meeting.

Success for public events was also measured in a variety of ways. One way was through general attendance: if a large number of people attended, the event was seen as successful. Another way was through the variety of people in attendance: if the event drew stakeholders from across sectors, especially from groups that are underrepresented in the Network (like parents), the event was seen as successful.

Similar to public events, the main standard for success of projects was the level of participation among the target population. If the project filled the number of participant spots available, it was seen as successful—clearly there was a need for the project or people would not participate in it. Over-enrollment or having a waiting list was seen as more than just successful. A second standard was how the projects fit into a larger strategic plan for intervention. According to one interviewee, "[The Network] has built Network projects to build upon each other: one takes up where another leaves off. The big payoff is looking at the projects as a system. One program isn't important, it is multiple touches." A third way public events were seen as successful was if they were replicated at the local/grassroots level, or inspired new activity at the local/grassroots level.

Interviewees and the DHE concur that the success of the Network with regard to inspiring and/or facilitating grassroots events is difficult to measure. As DHE staff noted, the effects of the Network in this area "can be as broad as all of the ripples" of a stone thrown into a pond. To truly measure all the activities, one would need to know everything that is going on with regard to STEM, something that was generally agreed to be impossible.

All the Networks described examples of successful grassroots projects/activities/events within their region. Though some of these were self-generated at the grassroots level, others of these were inspired by a Network activity or event and then replicated. In the words of one interviewee, "Activities done at the Network level are intended to inspire the creation of similar activities at the grassroots level: Network activities intentionally draw teams of people from communities so that there will be several people interested in starting their own event who can help each other." According to another interviewee, for something to be successful at the grassroots level, "People need to see local events as valuable. They need to want to do it. Every community has a different starting point, although it usually is not very high level."

Several interviewees pointed out that having members of committees know each other very well is important, especially in terms of developing collaborations that are above and beyond Network-organized activities. It lowers the threshold for collaborating on projects by eliminating the time needed to find out what others are doing. Members already know each other's work and can go directly to the appropriate partner for an activity. This circumstance has meant that some Network partners have been able to not only develop projects, but apply for, and get, National Science Foundation grants. In the case of these grants, it was reportedly both "around the table conversations" and knowing each other in depth that contributed to project development: that is, the familiarity and knowledge among members allowed for the development of a more advanced relationship and complex project.

Finding VI: The strongest participation in the Networks is by K–12 and higher education.

The strongest populations in terms of participation as members of the Networks are K–12 and higher education. When asked about key populations in their region, all Network managers and additional leaders mentioned the importance of these constituencies. These comprised the majority of people who were involved as members of the Networks. It was discussed by multiple interviewees that without K–12 schools, there could not be any project work and there would be no place for others to become involved. It is notable that this concentration is in alignment with the State STEM Goals, where four out of the five goals are education focused.

The majority of events/activities led by the Networks were focused on K–12 education, many on the STEM interest of middle school students. This was seen as a place where Networks could have the greatest effect for the level of resources they had to work with. Activities in this area included the publication of a webzine, having STEM representatives talk to all 7th-grade students in a district, organizing a week-long summer camp for girls, and running career fairs or expos that reached both students and parents. Almost always, institutions of higher education served as the hosts or leaders of these activities.

Finding VII: Business is viewed as a critical component in advancing STEM agendas and is the most challenging sector for Network engagement.

Getting business or industry to the table was seen as a critical—as well as the most challenging—task for most interviewees. According to one interviewee, "Business is the most important key population and the most difficult to engage. They are the wildcard—they drive employment. ... It is easier to get them to the table if they think there is an opportunity available." Many interviewees reflected on this challenge and described strategies to enhance industry participation.

Interviews suggested that Networks that were led by Workforce Investment Boards or Regional Employment Boards (WIBs/REBs) may have had some distinct advantages over Networks led by institutions of higher education. In these instances, business and industry were able to access services and information offered by the WIB/REB through the Network, with the Network essentially becoming a "two for one" point of access for STEM-related workforce information. According to one Network with a close relationship to a WIB/REB, the Network and the WIB/REB worked together to "offer a menu of opportunities for business/industry." Another interviewee commented that the ability to get STEM labor market information through the Network was seen as useful.

For some Networks, one measure of the success of activities was through the participation or attendance of business and industry in Network activities: if the event drew representatives of business and industry specifically, the event was seen as successful. This standard was generally the most difficult to fulfill for the Networks. According to one interviewee, the key to doing so lay in two things: (1) having a theme to the event that was of interest to business, and, (2) offering "home-grown solutions" to things that are a problem for local businesses. For example, one interviewee described having modified their symposia to better capture industry interests and needs: "Changing the symposia to have a distinct theme is seen as having had a great positive effect on attendance and interest/awareness. … This theme allows people to speak to particular program and training needs of business."

Finding VIII: The Networks still have under-tapped populations.

Several under-tapped populations exist that might be integrated into the Networks. These include professional associations, student associations, early education, out-of-school time, private/parochial schools, and underrepresented minorities. In addition there were some groups that were mentioned as being potential new constituencies to bring into the fold. These included students (especially at the higher education level through

having representatives of student associations involved with the Networks), special education teachers/representatives, parents, and general community members. Some Networks have tried to engage in outreach to these sectors, but with little success. Sometimes this was because those group members were simply too busy to become involved. In other cases it was unknown whether this has to do with not crafting a message that is meaningful to these groups or whether these groups are authentically not interested in STEM. Another potential reason is that these communities may have developed their own internal STEM support systems. Connecting to these groups however, was seen as important to many interviewees, especially with respect to increasing the diversity of the Network.

Interviewees associated with about half of the Networks talked about the importance of diversity in relation to STEM in general or the orientation of the Network in particular. In some of these cases diversity was an overt objective of the Network's activities and in other cases it was a consideration that underlay the overall orientation of the Network and/or its participants. This spoke to the prominence of the issue of underrepresented populations within the Networks. One interviewee pointed out that it was important for the Network to demonstrate multiple kinds of diversity. This person described their Network as having "a good level of diversity in multiple ways: (1) sectors, (2) points in the Pipeline (e.g., elementary school, high school, college), and (3) representatives of historically underserved communities." Other interviewees highlighted the importance of racial/ethnic and socioeconomic diversity.

Finding IX: Some Networks are seeing longer-term effects of their work.

Some Networks are now mature enough that they are seeing evidence of longer-term effects of their work. For example, former science fair participants becoming members of the Networks as professionals. Perhaps the most ideal measure of the success of the Networks is that the students the Networks affect actually become STEM professionals. One Network in particular spoke about how they currently have a professional participating in their Network who was a former student participant in the regional science fair competition that had been supported by the Network. This contributed to a sense of not just filling but fulfilling "the Pipeline."

Another aspect of long-term success is that members have an expectation of, and plan for, participation in the Network and its activities. Interviewees of another Network spoke about how the meetings and events were run "like clockwork" or "on auto-pilot"—that they could plan for them a whole year in advance and mesh their own STEM activities with those of the Network to maximize their outreach and resources. In fact, in one case this institutionalization extended to the relationships member institutions have with particular schools participating in an event. The groups saw themselves as set teams who were internally able to self-organize within the framework of the Network-managed event.

Summary: The Networks have engaged a wide variety of stakeholders and are largely credited with change in their regions.

The Networks are recognized as valuable contributors to their regions, the greatest contribution being that they are broadly viewed as leaders in bringing key stakeholders together and spurring their collective efforts. Whether people come to the Networks seeking to improve the STEM pipeline as individuals, looking for help with an activity or event, or wanting to connect with like-minded stakeholders, people reportedly found what they need related to STEM through the Networks. The strongest participation in the Networks appears to come from the education community (both K–12 and higher education). This participation pattern aligns with the education-focused State STEM Goals. This pattern does not suggest, however, that participation by other sectors is not important to the Networks. Business is seen as a crucial partner and is actively recruited by all Networks. Representatives from other sectors such as early education, out-of-school time/informal education, and private/parochial education all participate in at least some Networks, but not all. Still there exist a number of groups that remain under- or untapped in terms of participating in the Networks—the recruitment of which could

add more diversity of experience to the Networks in many forms. In terms of longer term successes, some older Networks now see institutionalization of relationships among their membership, whether that is institutionalization of the organization-Network relationship or institutionalization of member-to-member relationships. In addition, one Network has seen the ideal fulfillment of the pipeline premise in that a former student participant in the region's science fairs has become a STEM professional who participates in the Network as a representative of their business.

Research Question III – What, if any, statewide mechanisms might enhance individual Regional STEM Networks' effectiveness, and/or facilitate the scale up of effective practices? What should statewide support look like?

The interviews and focus group surfaced five main findings with regard to statewide support.

Finding X: Continued branding and messaging efforts would enhance public understanding that the Networks share a common purpose and, collectively, support a unified agenda.

A common theme among the Network managers is that there is a role for the state to play in consolidating the branding and messaging associated with STEM, the Pipeline Fund, the Regional Networks, and the STEM Advisory Board. Currently all the Networks look very different from one another—to the point of appearing as stand-alone organizations that are unrelated to one another. There does not appear to be a common understanding of how they are united in a common purpose and how they collaborate on and support a common agenda. Branding efforts could include a graphic standardization that would visually unify the Networks and the state, and messaging efforts could help with identifying a central mission for what the Networks do. Additionally, some interviewees suggested that a common look and feel would enhance the Networks' ability to increase business and industry involvement in their work. According to one interviewee, "Part of the success of the STEM event is creating a strong brand so employers want to be involved." This was echoed by another interviewee who said that business needs a strong brand to get involved.

Improved "branding" of the system of Networks would also enhance the legitimacy that the public attributes to the regional Networks. Making clear the Network's role within a state system, some contend, would decrease the perception that each Network is working independently. For example, one interviewee talked about how he actively works to present his regional Network as part of a nested system of national, state, and regional Networks that all work together to promote STEM. He also described his frustration with a notable lack of knowledge among the public concerning the existence of these systems.

Most Networks' contribution to and management of activities and events does not receive media attention. Rather, their host institution does. A side effect of both the lack of statewide branding, as well as limited local media coverage, is that the public may have a possibly distorted perception of the legitimacy of Networks' activities. Some interviewees described public confusion with regard to the purpose, meaning, and even existence of the Networks. In some cases, Networks are conducting activities without the benefits that public recognition for doing so might bring. Such circumstances may mislead the public with regard to the Networks' actual level of involvement and effectiveness.

Finding XI: Centralization and coordination of communication at the state level could further unify the Networks' activities and the public perception of their commonalities.

Interviewees suggested that the state could play a greater role in centralizing and coordinating communication related to the Networks in two ways: (1) among the Networks, and (2) for the Networks.

Centralizing and coordinating communication among the Networks could entail facilitating regular contact and information sharing via a listserv, internal blog, or other frequently updated form of communication. In this view, such efforts would be managed by the state, but the state would receive information from the Network managers and be oriented around supporting various Network managers' needs, in order to enhance Network effectiveness.

Centralizing and coordinating communication for the Networks would entail building pathways for information sharing between the regional Networks as a cohesive entity and other networks (e.g., WIB/REBs, school superintendents' group) or statewide organizations (e.g., MA State Science and Engineering Fair, the Department

of Elementary and Secondary Education). In other words, the state could serve as a unifying point among the Networks for speaking with other large groups. This would allow for one "voice" and one point of contact with regard to connecting to these groups as opposed to 10 (the nine Networks and the state).

Finding XII: Efforts to distill and communicate best practices across the state could contribute to an ever-expanding knowledge base of lessons learned and resources available to advance a STEM agenda.

As part of centralizing and coordinating communication, interviewees suggest that there is also a role for the state with regard to distilling and communicating best practices. This would apply to communication among and for the Networks. As best-practice projects are identified, their information would be captured by the regional Network in which they are located. The regional Networks would then communicate this information to the state which would either (a) facilitate its being shared among the regional Network managers, and/or (b) synthesize and pass the information on to a relevant statewide organization or department. A primary example of the latter would be enhancement of the state's facilitation of communication between the Networks and the STEM Council. The channel could also work in the opposite direction—that is, best practices as defined by the state could be communicated to the grassroots level via the regional Networks. This would lead to a strengthening and enhancement of both the Networks' and state's positions among STEM stakeholders, and would facilitate the building of knowledge of best practices generally.

Finding XIII: A call to highlight examples of business engagement with the Networks and the MA STEM Council was heard across all Networks.

As noted earlier, business engagement is seen as crucial by all Networks. Challenges with engaging business are associated with several factors, including regional resources (are there businesses large enough to be involved?), branding/messaging (does business/industry understand the role and purpose of the regional Networks?), Network-based opportunities (are the Networks running activities that either have a place for business involvement aside from funding, or that respond to needs of regional business?), and a lack of models for business engagement.

The study suggests that the state could help identify models for business engagement in the Networks in two ways. At the state level, the state could highlight businesses who would like to be involved either with the system of Networks as a whole or with specific Networks because of the nature of their projects/activities. This would be especially helpful to those Networks with fewer large businesses to draw upon locally. At the regional level, the state could also facilitate partnerships between businesses and the regional Network with which they should most logically be attached. Some Network Managers found, for example, that groups want to see entities similar to them involved with something before they become involved. In other words, businesses want to see other businesses involved with the Networks before they become involved. Managers suggested that the state could play a vital role in helping foster these generative relationships.

Finding XIV: The Pipeline Fund senior program manager position is critical to the system of regional Networks..

Interviews revealed a strong consensus among all the managers concerning the value that the role of Pipeline Fund senior program manager brings to the system of regional Networks. Staff in this position are highly regarded and seen as an invaluable partner in running the system of Networks. This position's management of all things administrative related to the Networks has facilitated Network operations. Further, all the managers could envision an expansion of the role/duties associated with this position to encompass the myriad additional tasks that the state might take on with regard to the Networks (including the suggestion by some that the position could benefit from support staff).

Summary: The Networks have reportedly made critical contributions to the advancement of a STEM agenda, and opportunities may exist to expand their effectiveness even further.

While the Networks are perceived to have accomplished a great deal in terms of advancing the STEM agenda within their current operational framework and level of resources, the study suggests a number of opportunities to increase their effectiveness. Most of these have to do with the relationship between the Networks and the state. There are broad communication-oriented areas having to do with branding, messaging, and legitimacy that could benefit from having a centralized and standardized component originating with the state. Changes in this area would have ramifications for things such as recruitment (especially of business), media coverage, and Network identity development. The process of distilling and communicating best practices could also be an area of improvement within the Networks, among the Networks, and from the Networks. The Networks are situated at a crucial point in a communication structure where they have the potential to be channels of best-practice information both upward and downward—that is, from the grassroots level upward to the state as well as the state downward to the grassroots level.

A key role that the state might play with regard to the Networks is helping with business engagement, especially of businesses that are large enough that they do not see themselves as belonging to a particular region. There was some thought among a number of interviewees that a potential exists at the state level for the formation of relationships with business that would inspire more relationships at the regional level (e.g., essentially there would be a role-modeling effect).

Lastly, the Network managers universally recognized the importance of having a strong program manager at the state level focused on their work. The staff in this position managed all things administrative related to the Networks, provided support for Network operations, facilitated communication (both among the Networks as well as between the state and the Networks), and, through their presence at Network meetings, embodied the state's view of the legitimacy of the Networks. Many managers saw the potential for expansion of this role.

Conclusion

The findings in this study are based on the views of Network managers, some Network members, and DHE representatives. The findings reflect the rich diversity of experiences that the Networks illustrate. For example, the Networks not only differ in terms of stage of their development (with some being mature, some being intermediate, and some being young), but also in terms of resources and activity focus. Each Network has a unique configuration of K–12 schools, institutions of higher education, non-profit organizations, and businesses—all which have different needs—upon which to draw for support and involvement which leads to differences in the activities in which the Network engage.

The older Regional STEM Networks have become established, "go to" places for regional STEM information with less mature Networks looking to replicate this status as they develop further. Interviewees from older Networks commented on how conditions have changed over time, both in terms of their Network's activities as well as in terms of the climate in which their Network operates. Previously, the Networks received funding for projects that were the focus of Network activity—now they do not. This has had an impact on their regional role, shifting them from project managers to conveners of others who engage in projects. In addition, the background climate the Networks operate in has evolved from one where people needed to be educated about STEM to one where people are looking to inform others about their own STEM activities. This has had an impact on the Networks' regional role by moving their communication focus from education and outreach to information sharing and facilitation of connections.

The Networks were considered valuable by all the stakeholders interviewed. The value gained from the Networks by individuals included connecting with like-minded people, receiving outreach support for activities, and gaining knowledge of STEM opportunities across the region. The value gained from the Networks by organizations included wider communication of activities/events, increased attendance at and success of activities/events, and increased knowledge among others of the organization's activities/events. While K–12 and higher education representatives composed the majority of Networks' membership, and were seen as essential for project activity, business/industry were also seen as very important, even crucial. A wide variety of additional sectors had some level of participation in certain Networks, including out-of-school time, early education, government, non-profit organizations, parochial schools, and parents. However, all Networks still possessed under- and untapped populations that could be accessed to help increase both their diversity of sector coverage as well as their racial/ethnic diversity. Examples of these include nonparticipating schools (e.g., K–12 public, K–12 private, community colleges, four-year plus higher education institutions), professional associations, student associations, special education teachers, minority associations, parents, general community members, and homeless families. While all Networks still have room to continue growing, the more mature Networks are seeing evidence of longer term effects of their activities, especially the development of a cohesive community of practice in which members know each other very well and can more easily engage in cooperative activities than if they had to "begin from the beginning" with regard to being familiar with each other.

Persistent challenges faced by all the Networks, regardless of their maturity or resource base, included (1) integrating business into Network management and activities, (2) dealing with internal turnover that results from a membership life-cycle, (3) reacting to turnover at participating organizations above and beyond that of the specific network representative (e.g., a change in the representative's supervisor or HR regulations regarding volunteer time) that results in changes to contacts and relationships, (4) messaging/branding/legitimacy, and (5) dealing with diversity. The integration of business was seen as crucial to the success of both Network operations and Network activities by a number of interviewees. Having business involved increased the resources available

to a Network (in terms of both volunteers and financing) and provided a picture of the workforce end of the pipeline.

Problems with internal turnover among Network members were described by several Network managers. In certain cases, people come in and out of the Network as part of a distinct life-cycle process. This process looks like this: a person develops a STEM need, they come to the Network for help getting that need fulfilled, the Network fills that need, then the person leaves the Network (or drops to being a passive member who only receives electronic information and no longer comes to meetings). Problems with external turnover were also stated by a number of Network managers, especially with relation to out-of-school time organizations and businesses.

Messaging, branding, and legitimacy issues were related to two things. One had to do with recruiting new members: because each Network largely operates independently from the others, there is no consistent message of what they do or how they are related to the state. Essentially, each Network is seen as its own smaller operation without connections to other geographies or the state. A consistent message might engage larger institutions or employers. The other had to do with receiving credit for activities when they are covered by the media. Instead of the Networks receiving credit, usually their host institutions do. This is likely because Networks do not have an easily recognizable identity as organizations independent of their host institutions.

Lastly, diversity in many forms is a persistent challenge for the Networks, especially among their memberships. Socio-economic status, race/ethnicity, gender, geography, and other background characteristics were all concerns among the Networks' memberships as evidenced by their target audiences and project participants. While some member institutions prioritize representing underrepresented groups at Network meetings or activities (in the interest of providing role models to students from underrepresented groups who for a number of Networks are the primary participants in projects), others do not and it is this built-in interest among members that usually drives prioritization of diversity at the Network level. This is not to say that the Networks cannot have influence in this area. In fact, in two of the newer Networks diversity was a central component of their identity at their initial formation and thus became an underlying premise to all of the Network's activities.

The views of the Department of Higher Education and the Network managers demonstrate a large area of convergence with regard to what a "next generation" model of the Networks might look like, especially with regard to the roles the state might play in it. Having the state have a more active role in branding/messaging, and centralizing some aspects of information sharing (e.g., an online project/program database), were consistently mentioned among both parties. The Network managers saw maintaining a coordinated state-regional structure as important in that having state backing behind Networks increased their legitimacy. The Network managers also saw a role for the state in helping to provide examples of business engagement that could have effects at multiple levels. Lastly, all the Network managers agreed that keeping the Pipeline Fund senior program manager —or at least someone in this position—was important to the maintenance of an effective Network system. Some could see a potential expansion of his/this role if certain aspects of state involvement with the Networks were to be implemented.

Overall, the study suggests that the STEM Regional Networks have effectively fulfilled an important role in developing the state's STEM landscape in multiple ways—a role that, while it continues to evolve, has a strong place in the ongoing work associated with the state's STEM agenda.

Appendix A: Interview Protocol for Network Managers and Additional Leaders

The following protocol was used for the interviews of Network managers as well as additional leaders. The Network managers were asked all of the questions. The additional leaders were asked questions 1 – 11 (questions 12 and 13 were only asked of the Network managers).

Protocol for Network Managers & Additional Leaders

Introduction:
Hello and thank you for agreeing to be interviewed for our 2015 Evaluation of the STEM Regional Networks. For this year's evaluation the Department of Higher Education has asked us to conduct a qualitative study addressing these goals:

1. To understand the role and duties associated with the STEM Regional Networks;
2. To understand what is, and is not, working regarding the building of STEM interest and awareness by the STEM Regional Networks;
3. To understand the ability of individual Networks to serve as grassroots coordinators of events and attract new audiences; and,
4. To understand what a potential "next generation" model of the STEM Regional Networks might look like.

We estimate the interview will take approximately 60 minutes.

We will be interviewing all nine of the STEM Regional Network managers because of each of your depth of knowledge. We look forward to hearing your thoughts and opinions during this conversation. In addition, we will be conducting a focus group with all of you at the April 16th STEM Regional Network Managers meeting as well as interviews with DHE staff and other selected stakeholders.

We'll be preparing a report for the Department by the end of June. As far as confidentiality, we'll report some findings from the study in the aggregate, and we may disaggregate other findings by region, by network maturity, by kinds of activity undertaken, and/or by interviewee characteristics. We will do our best not to identify individual speakers, but we're thinking that because the sample is small and participants and staff enjoy a high degree of familiarity it's to be expected that some findings may be associated with networks and their representatives. How does that sound/do you have any questions about that? What I'll also say about that is that if we do happen to stumble into some sensitive material, just let me know that and we can try to figure out a way to discuss the ideas or the information in a way that's comfortable for you. Does that make sense?

To help capture the conversation as accurately as possible, we would like to record this interview. The recording is for our own purposes—so we can confirm the accuracy of our notes—and we won't share it with anyone else. Is it okay with you if we record the conversation?

Turn Recorder On

Please know that you can ask at any time for the recording to be stopped. And please feel free to ask any questions as we go along.

Background Questions:

1) So, to get started, could you give us a little overview of your role and background with the SRN?

    a. How long have you been involved with the SRN?
    b. How long have you had a leadership role (or in-depth association) with the SRN?
    c. What brought you to the SRN?
    d. Which sector/constituency would you say you represent (e.g., k-12 education, higher education, employers…)?

OK—thank you! Now I'd like to have you walk me through some of the network's activities and engagement in stimulating awareness of and interest in STEM.

Description of Network Engagement:

2) Tell me a little about what your STEM Regional Network is/has been doing in terms of stimulating awareness and interest among key populations over the past two years.

    a. How have/did this/these come about?
    b. Is it / Are they being done in collaboration with anyone else?
    c. We are using the phrase "to stimulate awareness and interest." Can you say a little about what it means to you to "stimulate awareness and interest"? *Contextualize this a little bit. Been in use by the Council and Pipeline for a while…*

OK—thank you! That was a really helpful overview of your work. I'd be interested next in hearing some of your thoughts on what's been working well in terms of stimulating awareness and interest among key populations, as well as challenges.

3) First, to help me understand: Who are the key populations in your region? That is, which populations is it most important to have engaged in the SRN?

4) And in your view, to which populations has outreach been successful? Why? What did that outreach look like and what would you say made it work?

    a. Where there any preconditions to being successful?
    b. Were there important differences in working with one population as opposed to another?
    c. Did anything surprise you… in terms of maybe something working even better than you'd anticipated? *[explore…how so? Why?]*
    d. Did **you** do anything in these instances that was different from how the network has worked in the past?
    e. Was there any aspect of the **stakeholders'** engagement that was particularly helpful/useful? *[explore, who? How so, in what respects, with what effects ? Roles of particular people vs. groups or institutions]*
    f. How might this/these be replicated or scaled up?

OK thank you for that, it was a really helpful look into some of your successful work with key populations. Let's be sure we have the main points captured from that before moving on. What I heard was…

Now let's make a switch to thinking about some additional key populations.

5) First, are there any populations to which outreach has been difficult?

    a. Which ones?
    b. What/how did the Network try?
    c. What have been the biggest challenges in that regard?
    Probes: individual characteristics, timing, history, competition for territory, aspects of their organization (hard to reach, overextended), no immediately recognizable gain for them…
    d. IF TIME, looking back on that, is there anything we should be sure to note? …lessons learned, things the network might have done/would do differently….

6) We're also interested in knowing if there are any/what are the essentially "untapped" populations within the region? Who? Where? Characteristics? *Talk about students here if not raised earlier. Parents? Diversity Issues?*

Encouragement & Thank yous.

Let's switch now to focus specifically on the Network's efforts to organize, build and support outreach events.

7) What is your STEM Regional Network doing in terms of organizing, building, and supporting outreach events? *Note: answer to this may have come up earlier…*

    a. How do you define "outreach events"?
    b. What kind of outreach events has your SRN done?
    c. How did they come about?
    d. What is the network's interest in pursuing these types of events?

8) Again, we're interested in your thought on how effective is your STEM Regional Network at organizing, building, and supporting outreach events?

    a. To which populations have these outreach events been successful? Why?
    b. What did those events look like and what would you say made them work?
    c. Where there any preconditions to being successful?
    d. Were there important differences in working with one population as opposed to another for these various events?
    e. Did anything surprise you… in terms of maybe something working even better than you'd anticipated? *[explore…how so? Why?]*
    f. Did you do anything for these events that was different from how the network has worked in the past?
    g. Was there any aspect of the stakeholders' involvement in these events that was particularly helpful/useful? *[explore, who? How so, in what respects, with what effects?]*
    h. What kind of activities are you not supporting / organizing? Why?
    i. How might this/these be replicated or scaled up?

9) What might engage populations to a greater extent? *What would you have to do? What would they have to do? Where would it lead?*

    a. Currently involved populations
    b. "Untapped" populations

10) Are there things you wish you could do?

11) Do you have any other thoughts or comments?

Add Some transition comments…

Network Questions:

12) What, if any, statewide mechanisms might enhance individual STEM Regional Networks' effectiveness, and/or facilitate the scale up of effective practices? *(How should we organize? What of the current system should be retained? What would it contribute to you? What would it contribute to the group? General: system of organizational management?)*

    a. What should statewide support look like?
    b. How about a "Network of Networks"?

13) Do you have any other thoughts or comments?

IF TIME: reflect back again…

Thank you for taking the time to speak with me today. I greatly appreciate your thoughtfulness and insight. Have a good day!

Appendix B: Focus Group Guide

Below is the guide/protocol that was used for the network managers' focus group. This focus group was conducted as part of one of the standard quarterly meetings of the network managers.

PROTOCOL

Welcome: Thank you's, enjoy lunch (transition from morning?)

Purpose: Building on the individual interviews of the past few weeks (thank you), to further address this year's evaluation questions: What are the roles and duties of the networks? What are the networks doing to a) stimulate interest and awareness among key populations and b) organize or support outreach events? How effective are the networks in these areas? What might a potential "Next Generation" model of the SRN look like, including statewide support?

Process: We're viewing the focus group method as a structured discussion, a facilitated conversation. In this case, it's an opportunity to extend the scope and breadth of the individual conversations you have just had with us over the past few weeks. The value of the group is now to enrich the understanding generated through the individual interviews (very helpful and insightful) by offering you the chance to reflect collectively on the questions, including on some of the themes that emerged in those conversations.

So today Jean and I will ask some questions/offer up some responses we heard thus far, and then we'll listen and take notes as you discuss your answers among yourselves. We won't usually ask questions of one person in particular (except to clarify), and you don't have to answer each question. And it's OK to address comments and questions to one another, not just to Jean or me. So if one person's thought or comment makes you think of something or raises a point that you want to follow up on, go ahead and do that.

Confidentiality: Like the interview process… Jean will include findings from this discussion in this year's evaluation report. Names will not be in the report and effort will be made to keep identities unknown, but given the small group and high level of familiarity, we can't guarantee that ideas won't be associated with speakers. If there's anything sensitive, let us know and let's try to figure out how to communicate the idea in a comfortable way.

-We will ask in a minute for permission to audio record.

A few words on group process:

While this is not new information to anyone, I just wanted to offer that we'll all get the most out of the time available if we use our best group process skills. We're a medium size group, there's only 2 of us, and there's a lot to talk about in a fairly short time period, so to have the best discussion:

- Good listening skills, listening for understanding. Meaning-making: help us to summarize, use those skills. *Keep the primary questions in mind.*
- Air time: if you're a person who speaks easily and tends to form your ideas quickly, please try to make sure you're giving everyone a chance. And if you're a person who may take a little time

before speaking, please make sure that your voice is heard in the conversation (e.g., jump in a little sooner than you usually would)
- Chris on the phone: Everyone, please help us to stop and make sure we are including him. Chris, please speak up and we will do our best to help you be involved.

We'll go until 1:30? Any questions on the purpose or process?

OK we'll turn the recorder on and get going. **[TURN RECORDER ON.]**

Focus Group Guide

[Disclaimer that this is a short turnaround time and we have not analysed/synthesized fully!] Along the way, *if you have a key nugget or lesson learned that your colleagues should know about, please share. If there's a question on your mind, or if you have a question for someone, please ask.*

Q1 The role of the networks
Within the questions on what the networks do, and how effectively, are some assumptions/considerations of the role of the network…what has been the role, and what it is, and should be, now and in the future.

- We heard some commonality: facilitator, intermediary, communicator, convener, connector. Purpose is to bring people together, to remove barriers so people/orgs. can connect. In some cases, an evolution/transition from implementer of projects to facilitator.
- Generally we heard 'spillover' between stimulating interest and awareness, and outreach (*ref this year's Question*)
-

- Are there other ways you would characterize the role of your network? Purpose?
- Are there any clear distinctions between interest and awareness, and outreach? Important points?
  - Nuggets/lessons learned or questions?

Q1a Processes/Activities in support of that role

We heard varying approaches to defining and organizing the work, including:

- Needs assessments (surveys, collaborative sub-groups), strong/involved advisory groups and less advisory input, grassroots vs more network-initiated (including responsive to identified needs, interests, leader-driven); variations in purpose and nature of network meetings; involvement of WIB/REB

- So, collectively, what trade-offs are involved in shaping your work and implications?
  - Breadth vs depth: more people vs fewer and more/deeper involvement
    - Membership (if more grassroots, is membership less stable?)
    - Activities (likely success if continue past practice, vs outreach to new areas; events vs sustaining relationships?)
    - Meetings (locations, times, purposes—info for new attendees or regulars, administrative or substance)
    - Advisory boards/steering committees/executive committee[tension: differing interests board and members]
  - Nuggets/lessons learned or questions?
  - Challenges and solutions?
  - Implications?

Q2 Effectiveness/What is and is not working?

We heard varying approaches to understanding how effective the work is (generally participation #s-- members, attendees; also institutionalizing). Also commonality in what members derive from the network: connections, knowledge…

- Other approaches to capturing effectiveness?
- If the network is largely a convener, what is the value in bringing groups together?
- A challenge we heard: Where does the network begin and end? What counts as network activity? "a blurry line" [differences across the networks]
    - How to capture dissemination
    - Nuggets/lessons learned or questions?
    - Challenges and solutions?
    - Implications?

Q2a Hard to reach and untapped groups

We heard commonalities: pre-K/early ed., parents, school administrators, industry, students, student associations, professional associations, some sense of underrepresented groups (perception that "this is not for you")

- Nuggets/lessons learned or questions?
- Challenges and solutions?
    - HR
    - Identifying industry's interest/value added from engaging with the network
    - Others?
- Implications? Implications for the state?

Q2b Diversity issues: reaching diverse populations

We heard varying approaches to reaching diverse constituents: varying levels of explicit attention/perceived need. Generally in terms of target population rather than membership. Some common strategies (Latino STEM Alliance). Unique strategies/thoughts we heard: request female or other explicit representation from industry; explicit attention to serving underrepresented groups ("the high flyers already have resources")

- What are the trade-offs involved in achieving diversity goals? How do you prioritize: diversity vs what other concerns?
- At what level is diversity important (e.g., target populations vs. membership)? How? Why?
- How does diversity figure in the perceived role and activities of the networks?
    - It figures in the Plan, does that matter?

    - Nuggets/lessons learned or questions?
    - Challenges and solutions?
    - Implications?

Q2c Learning about other networks (may tie to Effectiveness)

We heard varying degrees of interest in knowing about the work of other networks. An apparent tension lies in defining and maximizing the strength of network: local (knowledge of context, established history) vs central.

Or, is the region the grassroots level? Does each network operate as its own network of networks?

- Trade-off : limited resources. Is there any incentive to learn about other networks (funds and time are limited, why learn if can't implement…)?

Thinking especially about *implications* (overlaps with **Q3** below)…

Previous efforts to facilitate exchange of information about one another have yielded some info, but what else might work?

- What level of knowledge about each other is necessary for the system of Networks to function? For you? Are you interested in "best practices"? How concerned are you about quality? ("best")
- What is the best way to learn about each other: signature activities? Work processes? **What would you commit to**? Would you or someone from your network volunteer?
    - Blog?
    - Website (s)..do you look at other networks' sites?
    - Social media?
- Should networks develop activities in common? What is the best way to develop activities in common?

    - ❖ What are the trade-offs involved (in any strategy proposed)?

Q3 Implications: Next generation SRM. How, if at all, could the state enhance individual networks' effectiveness, or scale up effective practices? "Network of networks?"

Commonality we heard: Need for branding, messaging, common look and feel
Heard across some networks: Call for better understanding of how to work with @Scale projects
Heard across some networks: There is value in being tied to statewide goals (focuses the network, or unifies, or legitimizes)
Heard across some networks: skepticism about too great a state/central role

- So, how can the state help with branding and messaging? What is most valuable?
- (Question from a few networks?) How can the Networks get members to consider themselves as representatives of the Network in other places?
- Should the networks be more (or less) closely aligned? Tension: How to align vs being too top down
- How to balance having a cohesive identity that fits statewide mission vs being responsive to grassroots needs….Conflict? Concerns (lose people)…

Questions about the statewide meetings:

- to drive interdependence among networks?
- Should statewide meetings includes advisory board members?
- Should there be a meeting for advisory board members?

Other state-related:

- What should the state do?
  - Technology
  - Related infrastructure …clearinghouse of programs, social media
  - Keep Keith's role
    - His attendance at network meetings is valuable
  - Highlight strengths of different regions and find ways to showcase those strengths

Possible

- Should the state help foster connections with hard to reach groups (pre-K, ?)
- Should the state set up a common task for networks to work on? (That's how we get to know each others' strengths…)

- What shouldn't the state do?

Commonality: Cut Keith's role

Other thoughts?

Q4 Wrap up

Other thoughts?
Key takeaways?

Appendix C: Protocol for DHE Leaders Interview

The following is the question protocol that was used for the interview with DHE Leaders associated with the STEM Regional Networks.

Protocol for DHE Leaders

Introduction:

Hello and thank you for agreeing to be interviewed for our 2015 Evaluation of the STEM Regional Networks. As you know, this year's evaluation addresses these goals:

1. To understand the role and duties associated with the STEM Regional Networks;
2. To understand what is, and is not, working regarding the building of STEM interest and awareness by the STEM Regional Networks;
3. To understand the ability of individual Networks to serve as grassroots coordinators of events and attract new audiences; and,
4. To understand what a potential "next generation" model of the STEM Regional Networks might look like.

As you know, we've conducted interviews, FG……

We appreciate the opportunity to explore the Department's perspective, thank you for talking…

We estimate the interview will take approximately 60 minutes.

To help capture the conversation as accurately as possible, we would like to record this interview. The recording is for our own purposes—so we can confirm the accuracy of our notes—and we won't share it with anyone else. Is it okay with you if we record the conversation?

Turn Recorder On

Please know that you can ask at any time for the recording to be stopped. And please feel free to ask any questions as we go along.

1) Goal 1: To understand the role and duties associated with the STEM Regional Networks.

a. Is there an official definition of the role of the SRNs? If yes, what is it? If no, how is their role defined? How has this been communicated to them?
b. What is the role of the SRNs relative to the STEM Council?
c. What if any official duties are associated with the SRNs? How, if at all, has this been communicated to them?
d. What if any unofficial duties are associated with the SRNs? How, if at all, has this been communicated to them?
e. What are the limits of the role of a convener or facilitator? That is, what can the SRNs legitimately lay claim to as "Network activity"?

f. What is DHE's ideal vision of the role and duties of a SRN? (Probe: what do you see as trade-offs between breadth and depth here?)

2) Goal 2: To understand what is, and is not, working regarding the building of STEM interest and awareness by the STEM Regional Networks.

a. What does DHE mean by "stimulating awareness of and interest in STEM"? How if at all has this been communicated to the SRNs?
b. Let's talk about your views regarding more and less successful activities run by the SRNs:
    i. What comes to mind as successful? Why? What is the standard for effectiveness? (Probe: how have these standards of effectiveness been communicated to the SRNs?)
    ii. What comes to mind as not successful? Why?
    iii. Probe: specific examples as needed
c. Does DHE have a vision of the kinds of activities they would like to see undertaken? How if at all has this been communicated to the SRNs? (Probe: What are the trade-offs here? Project work versus facilitator work.)
d. It is our understanding that you would like to see successful activities replicated by other SRNs. Why? What is the status of this? How does DHE see this as being accomplished? What are the pros and cons of DHE involvement here? (Probe: context-specific versus uniformity of best practices)

3) Goal 3: To understand the ability of individual Networks to serve as grassroots coordinators of events and attract new audiences.

a. What does DHE mean by "grassroots"? What is the relationship between "grassroots" and the SRNs?
b. What does DHE consider to be the key populations for a SRN?
    i. In terms of membership in the SRN?
    ii. In terms of targets for SRN activities?
c. Which populations does DHE see the SRNs as working with most successfully?
d. Which populations does DHE see the SRNs as having challenges with? What has DHE done to help the SRNs with their challenging populations? What could they do?
e. Which populations does the DHE see as untapped and/or undertapped? within the SRNs? What has DHE done to help the SRNs with untapped populations? What could they do?
f. How does DHE see the issue of diversity as it relates to the SRNs?

4) Goal 4: To understand what a potential "next generation" model of the STEM Regional Networks might look like.

a. What does DHE mean by a "Network of Networks"?
b. What is DHE's (ideal) vision for a system of SRNs? How do they relate to each other? How do they relate to the state?
c. What would be the primary role and duties of the SRNs individually?
d. What would be the primary role and duties of the SRNs as a collective?
e. What would be the primary role and duties of the state? (Probe: branding, social media, other communication)
f. Why maintain regional networks? Why not have networks organized by sector (early ed, K12 ed, higher ed, business) or some other characteristic?