Metro High School:
An Emerging STEM School Community

Volume I
Study Findings

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A PAST Foundation Research Project

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An Emerging STEM Community

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Cover Image: 'Young Captains' depicts Metro High School students who participated in a summer field program in partnership with Thunder Bay National Marine Sanctuary to record a portion of the wreck of the *Joseph Fay*.

FOREWORD

In the spring of 2006, the PAST Foundation began working closely with the Metro High School in Columbus, Ohio in the areas of curricula design, project-based learning and teacher professional development. Metro was the first STEM (Science, Technology, Engineering, and Math) High School, in Ohio. We worked with design teams as the educational philosophy for the new STEM school was evolving. Once the doors at Metro opened and the first students were admitted, PAST watched the faculty, students, families and local community embrace the experiment that Metro represented in educational reform. During the first year, as the PAST staff of anthropologists and educators observed the variety and richness of the STEM school experiment unfold, there appeared overwhelming public support that quickly led to a broad-based push for *more Metro like* schools across the state. This movement to expand STEM across Ohio prompted PAST to request permission to conduct a community and networks research study of the Metro School

Metro High School – An Emerging STEM School Community Study is the first step in establishing a new approach to understanding how educationally oriented public/private partnerships form and operate. The goal of this case study is to systematically explore the principles, processes and expectations associated with the Metro High School networked community. Unlike raw student assessment, this case study examines how to optimize the network, recognize the network's strengths through systematic social science analysis, and identify community and network processes that are present in a given place and situation. The larger goal of understanding the Metro networked community is to identify the key mechanisms that ensure sustainability, and to enable others to propagate the Metro High School model in different locales where STEM education is emerging.

The PAST Foundation's role in this effort was to 1) use our anthropological perspective to define new dimensions of school education reform so that other communities can use this study to discover their organization's strengths and connections and propagate them within their own educational environment, and 2) to lead these efforts away from traditional educational assessments and towards the 21st century approach to understanding the optimization of networks and the methods for strengthening community dynamics. It is our belief that an organization can achieve both success and sustainability once it knows *what* makes a network strong and *how* to engender a cultural framework of effective innovative practices.

We want to recognize and thank Kathy Sullivan, Director at the Battelle Center for Mathematics and Science Education Policy for partnering in this pioneering effort. This study could not have been successful without the supportive efforts of the Metro High School staff, students, faculty and parents, as well as the Metro Partnership Group for allowing us to study their community.

Annalies Corbin
PAST Executive Director

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PAST Board of Trustees, President

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1.0 ABSTRACT

Metro High School – An Emerging STEM School Community Study (ESSC) focuses on the Metro High School community and network in Columbus, Ohio. It is the first step in establishing a new approach to understanding how these educationally oriented, public networks form community and operate. The goal of this case study is to systematically explore the principles, processes, structure and expectations associated with the Metro High School community and network. Unlike raw student assessment, this case study examines how to optimize community building processes as well as the networks. In this way it is possible to recognize the strengths of each through systematic social science analysis, and identify community and network processes that are present in a given place and situation. The larger goal of understanding the Metro networked community is to identify the key mechanisms that ensure sustainability, and enable others to propagate the Metro High School model in different locales where STEM education is emerging.

In combining anthropological ethnography and public policy, we set out to conduct a research-based investigation to better understand effective education reform. In this approach, the study becomes a vehicle for providing information about the fundamental components of a learning community. This differs from the typical formal assessment and evaluation of educational programs that focus simply on whether the model is working or not. This study provides the opportunity to consider the foundational mechanisms, linkages and potentialities that will sustain the school as a system and contribute to the overall community's growth. In essence, this study does not assess, but instead points to ways that further strengthen relationships, inculcate good practices, and nurture long-term, sustainable processes. The study is presented in two volumes; *Study Findings* and *Research Data*.

2.0 INTRODUCTION AND STUDY OVERVIEW

> *America's high schools are failing to prepare too many of our students for work and higher education. Just ask business leaders and college presidents, who say they must spend billions of dollars annually to provide their employees and students with the skills and knowledge they should have attained in high school (Achieve, Inc. and National Governors Association 2005).*

This bold statement by the National Educational Summit on High Schools in the United States reflects the nation's growing frustration with the slow advancement of educational reform—a reform that must take place in order to prepare our students for the needs of the 21st century. The statistics behind this statement are troubling: they represent the potential for long-term adverse implications for America's educational system, as well as for our country's future workforce and economic development. In many states only one in three high school students meets their state's standards in math and English; nationally, only 71% of our students graduate from high school. The figures become even more troubling once a student enters college. Nearly one third of freshman undergraduates require remediation before they are ready for standard college course work (Greene 2005, National Center for Education Statistics 2003). These statistics represent a nation in crisis.

Although alarming, these numbers are not new, nor are they a surprise to most educators across the country. Low test scores and dropping graduation rates have been on the rise for decades. The question now is, what new or innovative approach to school reform should we try next? A growing number of educators, business leaders and elected officials argue that the US education system is still operating on a 19th century framework that is aligned to the needs of an agrarian society and uses a curriculum design better suited to a semi-skilled workforce. This has led many to propose that we need to step back and redesign schools both in terms of size and function. Many advocate that education at the secondary level should be refocused to specifically target proficiency in science, technology, engineering, and mathematics (STEM) education (Morrison 2007). To this end, several states across the US, including Ohio, have implemented STEM school initiatives.

In 2006 Ohio enacted a program called the Ohio Core to further the work of the "Third Frontier" initiative. This ground-breaking initiative was launched in 2002 to expand Ohio's technological infrastructure and spur new high-tech research, business-development, and job growth across the state. Concurrent with this effort was the development and launch of the Metro School. The Metro School in Columbus, Ohio quickly became the state's primary STEM demonstration site and has distinguished itself as a model for other STEM programs in Ohio and other parts of the country.

> *Metro demonstrates on a daily basis the kind of engagement we expect for our youngsters if they are to understand the problems offered by a complex world and become the kind of innovators and problem solvers that will advance our understanding. Metro's youngsters know why they are studying what they are studying and work in partnership with their teachers and mentors to achieve the highest level of engagement and, therefore, understanding possible (Morrison 2006).*

This observation occurred during the *STEM Learning Tour* funded by The Bill and Melinda Gates Foundation and the National Governor Association's Innovation America Initiative. This important event focused on the Metro School as an example of how states can create successful statewide STEM initiatives. In a short number of months, Metro moved to the forefront of STEM education as a public school with an implemented design that models the STEM education tenets delineated in *Rising Above the Gathering Storm* and *Tapping America's Potential* (NAS 2006, Business Round Table 2006).

On May 1, 2007, Ohio Governor Ted Strickland formally invited the citizens of Ohio to take notice of this growing movement across the state to address the widening fracture between traditional formal education and the on-going needs of both Ohio's youth and the state's long-term economic sustainability. Strickland's call was specifically aimed at drawing attention to the formation of STEM schools within Ohio (Strickland

2007). STEM programming has a fundamentally different premise than the dominant paradigm of educational policy and practice. This old paradigm views the school as a stand-alone educational unit that operates via hierarchies of authority, and attributes the performance of a school to the particular type of educational instruments that are used (e.g., curriculum and instruction) by the school leaders (Morrison 2007).

Ohio's first foray into the creation of specialized STEM school programs was initiated in August 2006 with the opening of Metro High School. The School is an example of STEM programming that is comprised of a richly inclusive public/private partnership from inception through current-day governance and operations. Originally designed as a hybrid program drawing from 16 school districts around Franklin County, today Metro is comprised of a community of learners where holistic learning is both program and project-based. During one school tour, Gates Foundation grantees noted that the sense of engagement and community within Metro is palpable from the moment a visitor steps foot in the door. It was evidence like this that compelled Governor Strickland to push to expand STEM-based education statewide in Ohio only two years after opening Metro.

With the passage of Ohio House Bill 119, Ohio lawmakers launched STEM education across the state and established five additional STEM schools. These new schools are all loosely based on the Metro model of school design that incorporates this community approach to ensure student success. This STEM school expansion signals to school officials, industry leaders, and lawmakers that Metro's public/private partnership model is a formula that works. The success of this model prompts the question, *How do we take the best practices that have emerged from the Metro experiment and further incorporate them into a successful state-wide effort to expand STEM education in Ohio?* The answer, in part, has been to use the Metro High School as a case study, to examine both the public/private network partnership that supports Metro, and to carefully look at the emerging community within and around the school. With this perspective, we can then offer essential understanding about the Metro Network Community to better define and clarify mechanisms that have resulted in such positive gains for students.

While we recognized the importance and potential of such a case study, it quickly became apparent that no single field of research could accomplish a thorough study of both the network and the community. Taking a lead from Metro's STEM programming, we decided to develop a multidisciplinary case study approach to investigate the Metro networked community. To ground this approach, we used Public Policy and Anthropology research methodologies as the basis of inquiry.

Metro High School – An Emerging STEM School Community Study (ESSC) focuses on the Metro High School community and network in Columbus, Ohio. It is the first step in establishing a new approach to understanding how these educationally oriented, public networks form community and operate. The goal of this case study is to systematically explore the principles, processes, structure and expectations associated with the Metro High School community and network. Unlike raw student assessment, this case study examines how to optimize community building processes as well as the networks. In this way it is possible to recognize the strengths of each through systematic social science analysis, and identify community and network processes that are present in a given place and situation. The larger goal of understanding the Metro networked community is to identify the key mechanisms that ensure sustainability, and enable others to propagate the Metro High School model in different locales where STEM education is emerging.

In combining anthropological ethnography and public policy, we set out to conduct a research-based investigation to better understand effective education reform. In this approach, the study becomes a vehicle for providing information about the fundamental components of a learning community. This differs from the typical formal assessment and evaluation of educational programs that focus simply on whether the model is working or not. Our study provides the opportunity to consider the foundational mechanisms, linkages and potentialities that will sustain the school as a system and contribute to the overall community's growth. In essence, this study does not assess, but instead points to ways that further strengthen relationships, inculcate good practices, and nurture long-term, sustainable processes.

This study proceeded from an ethnographic perspective, focusing on the networks of relationships involved in designing, launching and operating this STEM high school, and the community that has emerged within the school. Our aim has been to develop an evidence-based understanding of several inter-related elements that will assist with the successful development and propagation of the Metro model outside of Columbus. These include how the Metro network and community (1) affect academic achievement; (2) shape the social and cultural context for learning that has emerged at Metro; and (3) impinge on the policy and politics surrounding implementation.

This study reveals that the STEM program embraces innovation in all facets of education. This innovation, in turn, offers STEM supporters an opportunity to engage in a new approach to meeting our nation's educational crisis. This study identifies how Metro High School has been successful because it inspires the whole networked community to seek innovation in education; it values a commitment to accountability; it creates a nurturing community environment; it promotes problem solving; and it focuses on encouraging the program, staff, and students to realize their full potential. These components make up the Metro Network philosophy of sustainability. Most importantly, this philosophy does not have to exist only at Metro—it can be applied to future STEM programs across Ohio and the rest of the country.

The following sections walk the reader through these findings in a step-by-step fashion, beginning with the systematic methodologies required to collect and interpret the data. The methodologies are then followed by an analysis of the data sets that were collected by the anthropology team that researched the Metro community and the public policy team that researched Metro's public network. The successive sections then use these findings to explore the *framework* of the network and school community, the *phases* of the network and community, the *ties* between the network and community, and how the network and community must assist one another for continued growth. Although each part of the overall study, in its own right, is robust and could stand alone, it is the integration of the two that enhances, supports and—in some cases through the divergence of the data—points the way to optimizing STEM networked communities. Since the study is intended to lay the foundation for future research into STEM learning, a second volume is included to present demographic data and project-generated data that support these analyses, conclusions and recommendations.

3.0 METHODOLOGY

The study examines the structure and dynamics of the emerging community within Metro High School and of those networks that extend beyond the walls of Metro into the broader Columbus and Ohio communities. Our approach is fundamentally ethnographic, with two distinct but inter-related components. The anthropological component of the study delves into cultural factors and community formation within the school and focuses on the teachers, students, and parents at Metro High School. The public policy component examines primarily the policy and administrative networks outside the school that were pivotal in its formation, and that remain active in its stewardship.

The integration of the anthropologic and network perspectives is the main hallmark of this interdisciplinary study. Together the two approaches have captured a holistic understanding of Metro High School as a system (i.e., a networked community) consisting of teachers, students, parents, Franklin County school districts, and industry partners. The study reveals in its findings the social, political, and cultural connectedness of the school as a whole, as well as to its surrounding environment.

Focusing on the individual strengths of each discipline, fieldwork was conducted in concurrent phases in order to achieve an efficient and more comprehensive coverage of the study group in a relatively limited timeframe (January to April, 2008). Both disciplines relied on qualitative and quantitative data developed from unstructured interviews, guided discussions, questionnaires, and field observations, which allowed researchers to understand the emerging themes and patterns through an inductive process.

The Anthropology Principal Investigator (PI) designed and led a multidisciplinary research team to investigate community dynamics within Metro High School. The Public Policy PI designed and led the guided discussions and conducted data compilation relating to the public policy and administrative networks. After the research teams independently analyzed their findings, both the anthropological study findings and the public policy study findings were assessed to determine recommendations/conclusions based on the common issues and themes identified in each study. This process allowed for each research team to pursue the methodological strengths of their respective disciplines, and also to build on the combined perspectives of the two studies to construct a comprehensive understanding of the Metro School presented in the conclusions of this report.

The Anthropological focus of the study complements the research effort by examining the emergence of community within the school's framework. *Community*, as used in the context of this research, is defined through ethnographic research methods that explore socio-cultural relations among teachers, students, and others directly engaged in learning processes at Metro High School. Research questions have been designed to identify factors that contribute to this development of social relations and the formation of a Metro community within the school. Research questions also considered the cultural context in which diverse goals and needs were constructed in the course of adapting to the STEM program and a new school environment presented by Metro High School.

The Public Policy focus of this study was intended to complement the research effort by examining the structural and procedural underpinnings of both Metro's formation and its current operations, to study how this networked community is impacted by the policy and administrative networks that are the cornerstone of the Metro model. Network analysis also focuses on lessons learned from the formulation of the Metro concept with regard to the four modes of network management posited by Agranoff and McGuire (2001): *Activation, Framing, Mobilization*, and *Synthesizing*.

Data collection methodologies that formed the basis of the study included:

- Key Informant Open-Ended Interviews
- Written Survey/Questionnaires

- Observation
- Guided Discussions
- Follow-up Interviews
- Demographic Mapping

The analyses of collected data was coded and synthesized through the use of software programs NVivo™ and UCINET 6™, as well as statistical analysis.

Sections 3.1 and 3.2 present detailed discussions of the research design of the two studies. Section 3.3 provides a brief overview on the benefits of combining the anthropological perspectives of the Metro community with the broader policy context in which the Metro network is sustained.

3.1 Anthropological Approach: Rapid Ethnographic Assessment Process

The anthropological team included a multidisciplinary group of social science researchers and experts in education to conduct an ethnographic research effort guided by Rapid Ethnographic Assessment Process (REAP) (Taplin et al. 2002; Beebe 2001, 1995). This field-based research approach supports qualitative inquiry in a given community, utilizing *triangulation* and *iterative data analysis* methods (see below for full explanation of the terms as used in this study). This approach is intended to maximize data collection under time constraints that are more typical of problem-focused investigations, where intensive research collection is conducted in a short-term process rather than a prolonged traditional ethnographic field research effort which can extend from one year to several years. REAP, also termed Rapid Assessment Process, or Rapid Appraisal Procedure (RAP), has been used effectively in field research studies in the health field, and also in researching community development projects (Taplin et al. 2002; Beebe 2001). However, it has been used less in studying education and learning communities, and even fewer studies have included ethnographic research with students (Marshall & Rossman 1999).

REAP is more often used in applied anthropological research, designed to focus on project-specific planning or policy-making processes where pending decisions on a project or program can be informed by a short-term study focused on specific issues. Applied research is not intended to generate new theory, but instead is focused on a case study approach that contributes to the comparative understanding across different communities and situations where similar issues are at stake (Jorgensen 1989). The benefit of the case study approach also builds over time; as case studies are added to the literature, they can be used when designing future community studies as a basis for documented effective methods and procedures (Beebe 2001). This study will contribute to the literature on small schools and learning communities, opening a new area of research as noted earlier.

The real value of utilizing an anthropological approach is in gaining *insider* knowledge and perspectives about a given situation directly from those most closely engaged. In this effort, access is gained to "unrecorded or unknown data" in the context of locally known meanings, and locally held values to attain the "insider perspective" (Taplin et al. 2002; Ervin 1997). The holistic framework of anthropological inquiry also allows for the development of a set of related issues to take shape through the open and flexible characteristics of ethnographic research, which adds contextual understanding to the descriptions and explanations derived through iterative analyses (Patton 1990; Spradley 1979). Through an applied research approach, understanding can be gained beyond perspectives developed through statistical analysis, to learn directly from participants how they view priorities and goals, what is working and what is not, and what they are willing to do in order to accomplish the successful outcomes they seek.

The REAP design for this study builds on research techniques that accommodate rapid and intensive data collection utilizing triangulation processes that include *methodological triangulation* and *investigator triangulation*. *Methodological triangulation* was accomplished by using a range of data-gathering

techniques (e.g., unstructured interviews, guided discussions, questionnaires, and field observations) that provide the opportunity to investigate information about the same issue or topic derived from different approaches (Mathison 1988). *Investigator triangulation* involved a team approach in which all research activities were conducted by more than one researcher, each of whom was trained in a different discipline (Beebe 2001). This allowed for maximum information to be gained from each interview and from each field observation. The research team consisted of a socio-cultural anthropologist, an educator, an ethnographer/folklorist, and a public policy graduate student.

An *iterative* process also contributed an additional level of inquiry to the research design. Handwritten field notes kept by each researcher were made of each observation, open-ended discussion, or interview, creating multiple records for a given interview or observation. Transcriptions were then produced of each interview/observation. All transcription files were coded and entered into an NVivo™ database. The transcribed interviews were later reviewed by the team as a group to conduct qualitative data analyses informed by the perspective of each discipline, providing multiple interpretations in an iterative process designed to achieve in-depth exploration of the data. This iterative process is intended to identify recurring cultural themes and patterns that inform further analysis in later stages of research (Beebe 2001, Chronaki 2000). This process centers on identifying *intersubjective agreement* among different respondents who express similar perspectives about a given issue, or who describe an aspect of the situation using similar terms and phrases (D'Andrade 1995; Barnard 1988; Pelto and Pelto 1970).

The iterative process also requires identifying and involving *key informants* in the research process, bringing an *insider* perspective to the design of the research. A key informant is someone who is involved in the situation under study, holds a primary role, and has the ability to inform the research team of the larger picture of the situation in the community, including history and background of the problem or issues that are being studied (Ervin 2000, Marshall and Rossman 1999, Bernard 1988, Pelto and Pelto 1970). Key informants play an important role in the early stages of data analysis, as well as later phases when study findings are being confirmed. A key informant should also be able to identify other key informants to interview as field work progresses, and should also be capable of working with the research team in a range of research activities. These include participation in developing interview questions, identifying appropriate places to conduct field research activities, and otherwise assisting the team to become integrated in various ways in the community in a fairly rapid context in order to effectively organize activities and collect ethnographic data.

Primary data collected included interviews with key informants, interviews with others identified through the field research effort, classroom observations, and observation of events that were held at the school that occurred during the period of the research study. The events included the Town Hall Meeting, a Parent Teacher Student Organization meeting, and student activities such as the after school clubs. No audio or video recordings were made of interviews or observations. However, the team had access to a videotaped recording of the Town Hall Meeting that was held during the time period of the research project. Additionally, a student questionnaire was developed and conducted during the study. The written responses to the questionnaire were also coded by number, sex and grade level for purposes of analysis. All project field notes, transcribed written records and other materials were maintained by the research team following protocols established by the PAST Foundation to secure all data and protect confidentiality of all participants.

Protocols informing study participants about the study were also developed by PAST, including an *Informed Consent Form* (ICF) which was provided to all study participants (including the public policy interviewees) for review and signature. The ICF provided a full explanation of the purpose of the study, anonymity protections following *Human Subjects Research* guidelines, and contact information (Appendix A). The importance of providing an informed consent process assured that each voluntary participant had a clear understanding of the nature of the research, the intended outcomes and purpose of the study, and ultimate

disposition of all information gathered and recorded (Ervin 2000). Upon agreement to participate in the study, all study participants were assigned a code number, and all records associated with their information were coded by number and not by name. All project records were maintained in a locked cabinet at the PAST offices, and access to the cabinet was limited to the ethnographic research team members.

Phases of the study period are presented in Table 3-1: *ESSC Timeline* and show both the ethnographic research and the public policy field research efforts conducted beginning in November 2007, and concluding in May 2008. More detailed information about the anthropological research process is presented in the following sections: *Informant Interviews and Field Observations*, and *Student Involvement in Field Research*.

Table 3-1 ESSC TIMELINE

TASK	NOV	DEC	JAN	FEB	MAR	APR	MAY	JUN
Design Team Process								
Literature Reivew								
Methods/Research Design								
Permissions Coordination								
PAST Internal Review Board								
METRO High School Liaison (Students/Teachers/Staff)								
Public Policy Data Collection								
Ethnographic/RAP Data Collection								
Key Informant Data Collection								
Key Informant/Individual Data Collection								
Teachers								
Students								
Parents								
Staff								
Other (Metro liaisons and Staff)								
Field Observation								
Student Follow-up/Questionnaire Dev.								
GIS Mapping/Student Project								
Transcription/NVIVO Data Entry								
Coding/Analysis								
Draft Report								
Final Report								

Vertical stripe = Ongoing review/Oversight

3.1.1 Informant Interviews and Field Observations

The anthropological study included a total of 32 study participants selected for interviews, including 14 of the 16 Metro teachers. Student key informants were selected to include three 9th grade males, three 9th grade females, three 10th grade males and three 10th grade females, for a total of 12 student key informants. A total of six parents were interviewed for this study, two of whom were selected as key informants. A number of staff were interviewed in the initial stages of research, but were not involved in follow-up interviews. During the field research period, 42 interviews, 27 class observations and 18 school event observations were conducted by the research team. Additionally, a student questionnaire was developed and distributed to 108 students (54 9th grade and 54 10th grade students) who volunteered to participate in the research study.

Field observations originally focused on the classroom and after-school clubs in the early stages of the research project. The research team developed other activities for observation as they identified opportunities to observe social activities at the school. Researchers were also invited by the teachers, staff, parents or students to attend various school functions in which they were asked to participate (e.g., chaperone, school recruitment activities) providing further opportunities for observation of school activities.

Interviews were organized to begin in phases starting in January 2008. Initial interviews were conducted with key informants in a conversational manner and were approximately one hour in length. The process included an open-ended series of preliminary questions developed to focus on specific issues of interest to the research effort. A subset of the key informants were also asked to either suggest specific questions that could be asked on the topics of interest, or asked to comment on a list of possible questions for appropriateness of language and other aspects of the questions posed. Key informants were selected for this preliminary process among teachers, students and parents.

Once the schedule of questions was established for each group, the research team began conducting interviews in stages. Selection of interviewees was conducted differently for each group. Four key informant teachers and the twelve key informant students were identified by Metro Administrative staff and by PAST staff. Metro staff members were asked to identify key informant parents. During the course of conducting observations, the research team approached other informants, identifying adults, engaging in school activities, and pursuing questions with them during the observation. This led to an invitation and agreement to be interviewed. Staff and parents were also asked to identify others whom they thought would be interested in being interviewed, but this was very limited and resulted in a set of three additional parents being included as study participants. Teachers were the first group to be interviewed, followed by students, then staff and parents. Coordination with the school was assigned to two key individuals. One member of the research team worked closely with a Metro High School staff member who assisted with coordinating student interviews and some field observations. Work with teachers was conducted (by their preference) via telephone, email, or in person directly with the research team. Parents were also contacted directly to arrange interview appointments at their convenience. Interviews were conducted at Metro, or at the PAST offices (located at the same Ohio State University facility as Metro High School), at the convenience of the interviewee.

Interviews based upon the schedule of questions, were approximately thirty minutes to one hour in length, and were designed in an open-ended format in which the research team conducting the interview could pursue ideas or comments made by the respondent at any point during the interview. Interview schedules appear in Appendices B-D. The teacher interview schedule includes 20 questions, students were asked 24 questions, and parents were asked 15 questions. Many of the same questions were asked across the three groups, which provided some comparative data on *concept of community* and issues related to *community building* processes. These are presented in Table 4-1: *Concept of Community Interview Questions* and can be found in Section 4 of this report.

3.1.2 Student Questionnaires

Early in the development of the project design, a discussion of the role of the students in activities that occur at Metro High School led to interest in designing a phase of research that could be conducted jointly by researchers and students. In the course of the study, the research team also noted general interest and curiosity about the study, and sensed an expectation on the part of some Metro students that many students would be involved in the ethnographic research project. The idea of conducting focus groups was considered in an early stage of the research design. However, complications arose when multiple school days were cancelled due to inclement weather. The project team determined that the effort to recover all missed school days by the end of the trimester would not permit additional events to be added to the school schedule, even

if held on a weekend or evening. For this reason, the research team conducted a written questionnaire process with the student key informants *in lieu* of focus groups.

The key informant students were first asked a set of (24) questions, (see Appendix B) and the research team recorded their responses. The students were then asked to identify questions that should be asked of other students to learn more about the Metro community and other important issues from the student's perspective (see Table 3-2: *Ranking of Student Questions by Student Key Informants)*.

Table 3-2
Key Informant Student Input to Construction of General Student Questionnaire

The Key Informant students (KI) chose the following questions at the close of their one-on-one interviews. These are the key questions asked of all METRO students. The KI students were asked to select from the interview schedule of 24 questions. Of the 12 students interviewed, the questions below were selected by at least 4 – 6 students as shown below.

		Questions selected by KI Students	
Q No.	Int No.		Student Count
1	4	How do you feel about your progress?	5
2	7	What was your idea of M before you came here to be a student?	6
3	8	Was it your choice to come here?	5
4	9	What is your idea of M now?	5
5	10	What do like most about M?	5
6	11	What do like least about M?	4
7	12	What is the concept of community at M?	4

Based upon the student ranking, the final Student Questionnaire included ten questions that required written responses (see Appendices E-F). The questionnaires were distributed to students on a voluntary basis during an Advisory class in March by arrangement with the school. The team distributed and collected the written responses on the same day, allowing a 30-minute time period for each student to complete the questionnaire. Questionnaire's were coded and analyzed for various key themes and organized into tabular displays. These are presented in Volume 2 of this report.

In addition to the Student Questionnaire, the research team pushed further into the Metro student body to involve them in the study of their community by focusing on the most fundamental level of the school community: the school's physical *footprint*. After some discussion, a class of geometry students was asked to conduct a mapping project of the school as a student project entitled, *Mapping Metro*. The project was developed as part of a math class exercise, and is reported in Appendix G.

The following section provides a brief overview of the analysis of data developed from field research, presenting the sequence of work, and a concise description of the analytical process undertaken.

3.1.3 Data Analysis

Analysis of the data collected through the research process involved various types of triangulation, and relied on an intensive iterative process through successive phases of analysis that were initiated early in the field period and concluded in May 2008. This process included the following steps:

1) Multiple written transcripts were produced for each interview or field observation (recorded by individual team members, each of a different discipline, and generating a minimum of two transcripts for each interview);
2) Review of interview transcriptions was conducted through a team process initiated in the early stages of field work, to construct a multiple-disciplinary approach to interpretation and preliminary analysis of qualitative data, and to provide for a systematic refinement of research issues;
3) Coding of research topics occurred in stages, with preliminary coding conducted independently by each research team member, followed by review and consensus of the group to identify inter-subjective agreement on *recurring cultural themes* (ideas, concepts or phrases used by more than one respondent [e.g., *trust, family, issues associated with time*]);
4) Displaying the coded data in a tabular format was developed in stages, with group review and discussion focused on organizing the final set of cultural concept categories (see Table 3-3, *Recurring Cultural Themes*); team members also developed tables displaying quantitative interpretation across respondents (e.g., responses to questions tallied in list form, such as naming entities and individuals they think are part of the Metro community, or responses to questions concerning what an individual likes least or likes most about Metro); and,
5) Further refinement of the data was developed through a group process in which the major findings of the study were again reviewed and discussed thoroughly; transcripts were reviewed multiple times by different team members to build consensus of interpretation on cultural concepts and analytical categories; a final matrix display provided a systematic framework to identify research findings and to develop conclusions.

The research findings are presented in Section 4 of this report and are organized by key themes. These themes include perspectives on concepts that define the community at Metro; expectations and motivations of teachers, students and parents engaged in common goals for academic achievement and professional development; and key mechanisms of community building that study participants identified as important factors in maintaining mutual commitment to academic success. Section 4 concludes with issues that were identified as challenges that provide insight on areas of the Metro High School Program that study participants say need to change or improve in some way. They include improving communication and missed opportunities to engage in activities within the Metro community, including expanding opportunities with Learning Partners; Mastery[1] and related concerns that stem from time pressures to meet expectations and consequent social impacts to the community as the school advances to year three of the program; questions about commitment and involvement that contribute to weak community ties and social relations; and issues related to diversity and student self-segregation.

The discussion that follows presents an overview of the research design for the Public Policy study of the Metro network, including theoretical considerations and analytical approaches to understanding the Metro High School network model.

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[1] Mastery Learning is education instructional methodology that assumes all students can achieve mastery in learning if: 1) they are provided with the appropriate learning conditions, and 2) they are allowed to pursue a learning objective until they demonstrate proficiency. Mastery focuses on outcome. This methodology is based on Benjamin Bloom's *Learning for Mastery* model and was first employed in education in the 1920s in Pennsylvania. Unfortunately, technology at the time was insufficient to support this methodology. Today Mastery Learning is employed throughout world. The states of Rhode Island and Connecticut have switched their entire student assessment process to Demonstration of Mastery (Block 2000, Bloom 1981).

Table 3-3 Recurring Cultural Themes

CULTURAL MATRIX Key Concept		CULTURAL MATRIX Second Order Concept
M meets its mission		Time
Better Y1		schedule
Better Y2		pressure to advance
Difference in Y1/Y2		fluid/dynamic
		continuity
Mastery		lack of time
		effectiveness
Community (Q10,11)		
		Opportunities (Q20)
Community-building (Q14, 15,16,17)		
		Behavior
Integration of Community		modeling M habits
evolving/improving		respect
unity/involvement		responsibility
buying in		leadership/personal initiative
friendship		spotlight effect
trust		accountability
M physical environment		
ties to M (Q17)		
participation (Q13)		Common Goals Shared Interests
Fragmentation of Community		Diversity
self-segregation (academic, gender, racial, age, geo)		
not buying in		Democracy
lack of involvement		equity
lack of communication		voice & empowerment/THM
lack of commitment		participation
pulled in too many directions		
stress		
		Family
Communication		problem solving
T/T		working together
T/S		caring
S/S		safe
T/P		
T/S/P		
P/Stf		
T/Stf		
Communication about M		
Collaboration		
T/T		
T/S		
S/S		
T/S/P		
P/S		
LP		
Columbus Community		

T= Teacher, S= Student, P= Parent, LP= Learning Partner, THM= Town Hall Meeting, M= Metro, Stf= Staff

3.2. Public Policy Study

Metro High School was built by and continues to operate as an integrated network involving persons from the non-profit sector, school administrative staff, leaders from academia, and members of the greater Columbus community. The Metro network, as in all public policy and administrative networks, is a structure that involves multiple network participants with multiple linkages, working on cross-boundary, collaborative activities. Just as single organizations require some degree of management or leadership to function effectively, this collaborative, integrated structure also requires leadership that facilitates productive interaction and moves the parts toward effective resolution of problems. As will be shown in Section 5, in some circumstances, the integrated structure of Metro is led by differentiated leaders: various persons at various times perform different leadership roles. In other situations, a network participant representing a specific agency who is ultimately held accountable for arriving at an effective, shared solution may *take the lead*. This type of distributed leadership is common in networks.

The public policy analysis presented in this report demonstrates that Metro is both a formal, networked structure and a collection of informal relationships that transcend organizational, governmental, and sectoral boundaries. The findings elucidate just how extensive Metro has integrated into a network with critical individuals filling particularly important roles. Far from being a hierarchical, top-down organization, Metro was spawned from a small network of critical individuals, expanded into a larger network as the school was being designed, and now operates as a structure with multiple *nodes* and multiple linkages making decisions at the network-level. The network is centralized to some degree, as will be shown, but the number of key network participants and the ties between these network participants suggests that network processes facilitate Metro's operations.

The intent of this research is to describe and explain the network that emerged throughout the development of the school and now exists during the operation of Metro High School. Rather than conduct an evaluation of the school itself in relation to the network, the network was studied in order to discover its social, personal, structural, and procedural dynamics. The network analysis focused on lessons learned from the formulation of the Metro concept, its implementation, and the collaborative structure of the network that maintains broader support for the school. Data was collected through two mechanisms:

1. In-depth discussions with 28 key individuals involved in multiple ways with Metro; and
2. A questionnaire completed by 54 respondents, all of whom report some prior or continuing connection to Metro.

This report thus offers findings from both qualitative and quantitative data that have been "linked" (Fielding and Fielding 1986) to provide a much more thorough description of the Metro experience than is possible with just one type of data. The following section explores the methodology of the public policy study. Section 5 presents the behaviors associated with managing the Metro network, and what the network looks like currently, reflecting both the interview process and the questionnaire analysis. The study then shifts, exploring in depth the underpinnings of the network such as *Trust and Engagement* and *Decision Making*. In conclusion, the public policy study examines the strengths and unique characteristics of the Metro Network, as well as this study's contribution to the body of work on managing public networks.

3.2.1 Public Policy Approach: Grounded Theory

The public policy portion of the Emerging STEM School Community research is a *grounded theory* or inductive study, in which the research design is intended to generate rather than validate any prior theory. Research through grounded theory does not begin with a preconceived theory in mind; rather, the researcher begins an area of study and allows the theory to emerge from the data. Grounded theory thus means theory that was derived from the data, systematically collected and gathered, and analyzed through the research process. Basically, for this research, it is a way to look at the Metro network empirically (primary data) from the perspective of those immersed in the arena. As is the case with other qualitative methods, grounded

theory depends on in-depth analysis, so the researchers placed great reliance on detailed knowledge derived from the data collection process.

Grounded theory is far from being non-systematic. Avoiding a pre-structured design in research often results in only thick description of raw data as opposed to analysis. Indeed, some grounded theory applications allow for a frame of reference or a theoretical lens through which to analyze the data. Miles and Huberman (1994) recommend designs that pay prior attention to a conceptual framework, as well as research questions, sampling, and instrumentation that have a "focusing and bounding" role (Miles and Huberman 1994:34). The grounded theory approach taken in this study thus "puts the qualitative researcher somewhere between designs based on deductive quantitative…testing of explicit theoretical propositions and descriptive and causal inference, and thick analysis of nominal data analyzed by inference" (Agranoff 2007:39). Such a grounded theory perspective allows for the application of a conceptual model of network management proposed by Agranoff and McGuire (2001; McGuire 2002), which is discussed in Section 5.

Table 3-4: Policy Research Study Group

Discussion Respondents	28
Discussion Respondents who filled out Questionnaire	25
Questionnaire Only Respondents	29
Incomplete Questionnaires	1
Questionnaire Respondents not included in Network Analysis	9
Total Policy Research 'n'	**57**
Analyzed Questionnaire Policy Research 'n'	**44**

Note: red font indicates the questionnaires that were not included in the final analysis.

3.2.2. Themes of Network Development: Differentiated Interviews

Focused discussions were conducted with 28 individuals identified as key to the school's design and implementation:

1. CEOs of the two major institutions that launched Metro;
2. Individuals that represent the Metro Partnership Group (MPG) who continue to steer the Metro concept; ,
3. Individuals that represent the Learning Partners involved in curricula development, internships, mentoring, tutoring and other programs.

The initial two discussants were identified by representatives of the PAST Foundation, Battelle, and the Metro school staff. As a result of this initial wave of guided discussions, the research led to the identification of other key individuals and more discussions were arranged until 28 semi-structured discussions had taken place. This type of sampling where the initial study respondents identify future respondents from among their acquaintances is referred to as *snowball sampling* (Salganik and Heckathorn 2004).

A document referred to as a discussion guide was used to generate respondent information (see Appendix H). Unlike the survey or questionnaire research in which the same questions were asked of each respondent in an identical way, the discussion guide steered conversations with preselected network participants according to

a common format. A series of research questions put forth by the researchers was translated into a set of discussion questions that constituted the guide. The discussion leader took notes for each of the questions asked of the discussants. The responses to the discussion guide reveal unstructured but organizable information that fits into categories established by the research questions. Use of the discussion guide was systematic because the conversations were directed to the same issues for each discussant. However, each discussant was given the opportunity to elaborate and to offer insights on an issue.

The field research followed a research design sequence adapted from a previous guide used by Robert Agranoff, lead investigator of the public policy portion of the overall study (Agranoff 2007). Agranoff's sequence was as follows:

1. Design by major conceptual and research question development;
2. Preliminary case orientation and scanning the terrain by gathering documentation and other relevant information;
3. Preliminary selection of initial prospective discussants;
4. Formatting and outlining of the discussant interactions;
5. Preparation of the guide for focused discussions in the field;
6. Interviews/guided discussions with initial discussants;
7. Identification of other relevant discussants;
8. Complete all discussions;
9. Recording of post-interview impressions and transcript development;
10. Organizing information into categories of data; and,
11. Development of conceptual findings.

Analysis of the discussant-generated data was conducted with the transcripts developed from the completed discussion guides for each discussant, which included information from answers to more than 400 total question responses. The researchers reviewed the interview data, coded responses in relation to the research questions and organized the responses according to a research design outline displayed in Appendix J. During this process, researchers considered and compared explanations seeking patterns, while establishing conclusions that were most congruent with the data. This process was a rigorous and consistent mode of examining and comparing information. As a means to answer a few selected research questions and further analyze the discussant data, the qualitative research software package NVivo™ was used as an analytical and data sorting tool. It should be noted that the NVivo™ analysis did not replace the coding process used by the researchers, but rather pointed them to quotes, comments, and other types of notes that enabled them to develop and/or verify conclusions that emerged from the interpretive coding.

3.2.3 Social Network Analysis

The other approach to data collection and analysis involved an exploration of the social and professional network that defines Metro. A network-level perspective typically draws on many of the behavior, process, and structure ideas developed by organization-level researchers (McGuire and Silvia, n.d; McGuire, 2002), but the perspective focuses on explaining properties and characteristics of the network as a whole. Network participants (*nodes*) and the relationships among the network participants were also examined. The data collection began with a selection of focal nodes and identified the extended universe of nodes to which they are connected. Then, it was determined which of the nodes identified in the first stage were connected to one another by contacting as many of these newly-identified nodes as possible. This network analysis is thus a study of the whole Metro network as defined by the 57 discussion and questionnaire respondents.

Network data was collected through a two-page questionnaire (see Appendix I) completed by 25 of the 28 discussants, as well as an additional 29 respondents that included individuals noted in the initial discussions, Metro administrators and teachers, and other persons connected in some way to Metro. The core of the questionnaire was a question that asked each respondent to name up to 16 individuals who were most

important to him or her, in terms of their involvement with Metro school. Employing a six-point scale format devised by Rensis Likert (Babbie 1995) that ranged from *Never* (0) to *Daily* (5), respondents were asked to indicate how often they worked with each individual regarding seven different activities:

1. Providing information,
2. Receiving information,
3. Providing financial resources,
4. Receiving financial resources,
5. Joint planning,
6. Involvement in projects, and
7. Policy negotiations.

Ninety-four (94) individuals were named in the 53 completed questionnaires, resulting in a network of 310 connections. Using the UCINET 6™ and NetDraw™ software, the data from the questionnaire regarding the scope of the network and its depth is visually portrayed in Figures 3 through 10. In addition, various measures of the structural properties of the Metro network have been calculated, explained, and reported, and will be discussed at length in Section 5 of this report.

3.3 New Approaches to Integrated Research

This study adopted an approach to researching Metro High School that was developed from the methodologies of cultural anthropology and public policy. The value of the two perspectives can be found in the differences in explanations and insights, and in considering the range of research findings that reflect the distinct views of each study. The REAP process utilized by the anthropological team provided the research framework for cultural analysis of a school community as a unique, small learning community which has evolved with its own set of cultural principles expressed in social interaction and linguistic practices. The REAP research methodologies as noted earlier in this section, have not been fully explored for use in the field of education, and therefore are of interest because of the rigor that is introduced through the multidisciplinary design of the REAP research approach which is conducted in a relatively short timeframe. Furthermore, human communities are complex and are not easily dissected to see where function and dysfunction are occurring, or where emerging issues are leading to cultural shifts and social and political consequences in the stability of a given community. The REAP approach provided a contextual framework in which to explore these issues.

The REAP study relies on the key research strengths long established by cultural anthropologists who have pioneered the ethnographic field research tradition. The investigation of culture as a learned aspect of human experience offers a wealth of anthropological case studies that provide insight into the ways, in which communities function, and the ways in which community members work together to solve problems. Additionally, where communities fail in their efforts to find common solutions and overcome obstacles, we gain in our understanding of what works and what does not work. The applied research approach of this study also presents the opportunity to create a case study analysis that can inform community members and others engaged in day-to-day decision making about Metro that ranges from the individual, to the various diverse groups that form the Metro community.

Likewise, the public policy study provides the opportunity to consider Metro more broadly, in a comparative view informed by network theory, where the focus is on the activities and interactive processes that were developed by those who became part of the process as the Metro Program design was formulated and implemented. In this analysis, we can gauge the unique attributes of the Metro network in terms of other networks. In the theoretical discussion of the network, we gain further understanding of how networks are managed, providing a basis to interpret how the Metro network actually functions. This process of applied theory sheds light on potentially important and uniquely instrumental attributes for future STEM based networks. Additionally, the outcome of the research is one which both informs our purpose and need to

understand the way in which Metro operates, as well as provides further investigation of the authors' network theory model which can be applied to future STEM school studies.

Research findings of the anthropological study and of the public policy study are presented in Sections 4 and 5 respectively, in order to provide a detailed discussion on the analysis of findings based on the methodological rigor and focus of their respective methodologies and perspectives. The combined understanding gained from these two studies is presented in the conclusions and recommended actions in Section 6 of this report. The integrated effort was highly productive on many levels, exposing the way in which interdisciplinary efforts provide insight and *ground-truthing* for one another. The advantage of being able to question, consider and discuss the network and community from various perspectives sheds light on issues and potentials in ways that would never have arisen had only a single research approach been applied. Furthermore, combining the research at the analytical juncture illuminated where the network and community meet, where they have fully integrated, where each entity can improve, and how they can assist each other in better attaining goals. It is our hope that our efforts will result in establishing a new model and perhaps a new paradigm that will guide research on education reform.

4.0 ANTHROPOLOGICAL FINDINGS: CONCEPTS OF COMMUNITY AND COMMUNITY-BUILDING

The study of the Metro High School community was developed in response to the surprisingly rapid and robust emergence of a sense of community among teachers, students and their parents. Investigating how this occurred and what value it has for Metro students and teachers in achieving academic goals provides insight on how learning communities function. It may also shed light on the strategic support and nurturing of community-building mechanisms that are essential to sustaining the Metro community as it grows to full enrollment.

Ethnographic research focuses primarily on what people say about their experiences, and seeks to confirm those views through observation of, and participation in everyday interaction of a given community. Studying what people say as data can both inform how people perceive others in relation to themselves, as well as reveal how people negotiate the meaning and value of the social relations that represent their community and the role they play in it (Kondo 1990, Holland and Quinn 1987). The issues raised through ethnographic research are derived from data developed from one-on-one interviews, and from our observations of students, teachers and parents interacting in the course of classes and after school activities. The data gathered reveal a range of shared views and perceptions about what is working, as well as what is not working at Metro High School. The study also presents ideas about what individuals think should happen as Metro grows, and in some instances reflects what individuals are willing to do themselves to "make it work."

The *concept of community* at Metro High School is described in different ways among the study respondents, and carries different meanings depending upon the role and experience of a given respondent, whether a teacher, a student, a parent, or staff, etc. However, when reviewing the responses of individuals within these groups, and when considering the responses across groups, *recurring cultural themes* are apparent in terms of what teachers, students, parents and staff say about Metro. These themes reveal issues that are at the heart of the dynamic formation of the Metro community that indirectly serve to support students and teachers in attaining their academic goals. In essence, these themes reflect human endeavors that are by nature socially and culturally constructed and therefore, should be considered as essential to understanding Metro's achievements.

This analysis offers a view of the communal framework and effective cultural mechanisms that comprise community-building processes, and provides insights on the value and benefit of these processes toward meeting academic goals. In part, the analysis shows that shared academic priorities and values held by students, parents, and teachers are strongly connected with the goals for building and maintaining strong social relations among teachers/students/parents/staff. This connection also fosters and improves the collaborative processes fundamental to the Metro program. Most study participants expressed a belief that building strong social relations is indirectly linked to successful academic progress in various ways that will be discussed in this section.

The implications for Mastery-based learning suggest that the social context for learning is crucial to successful academic performance. Achieving Mastery is in part supported by design and structure through collaboration among teachers, among teachers and students, and among students working with students, as well as collaboration with the Metro Learning Partners. For many students and teachers, collaboration is the cornerstone of a key learning strategy practiced by teachers and by students that is required by the Metro Program. In our study, respondents suggest that collaboration is either: 1) based upon existing social relations, or 2) a factor in establishing social relations. In both views, building strong social relations is an essential component of the context for learning, and therefore, is an essential element of the Metro Program.

The study also explores the distinct attitudes and behaviors that comprise the core cultural values of the Metro community that derive in part from the guiding principles of the school embedded in the *Habits of a Metro Graduate* (see Table 4-3, Section 4.1). The expression of personal motivations and aspirations of students, teachers, and others engaged in the day-to-day life of the school is frequently captured in familiar terms and phrases used by teachers and students to describe Metro and their role within the school community. These descriptive explanations reflect a shared lexicon of what students and teachers alike refer to as "the Metro Habits." The behaviors and language inculcated through the Metro Habits not only establishes a common set of academic and intellectual principles, but also provides a holistic frame for reciprocal social interaction between teachers and students, establishing roles as well as role models.

The study also examines areas where study participants hold diverse views. In this diversity we also find discord and frustration on issues that present a challenge, where there is a perception that expectations are not met. In studying areas of disagreement, we can also identify recurring cultural themes that point to potential unmet needs in terms of resources, tools, or capacity to push through to a solution toward meeting expectations. In these areas of discord, it is clear that many of the study participants believe that commitment and involvement are key factors that can signal a willingness to work together to solve problems, to change the status quo, and to achieve desired common goals. Conversely, the perception that some individuals have a weak or nonexistent commitment to the Metro Program is a sign that there is a lack of commitment by some and therefore a lack of willingness to work together. There is a perception that these individuals--both teachers and students--present a challenge to the fundamental underlying community concepts, and this serves to weaken the potential for the all participants to achieve success.

Study findings in this section are based upon analysis of the interviews, observations, and student written questionnaires. Where quoted statements are used, the respondent code number is provided in order for the reader to gain a sense of the distinct views of different individuals in the study. However, study respondents remain identified only by code number to protect the confidentiality of the respondent. Teacher study participants are also described as Year 1 or Year 2, which indicates teachers who began teaching in the first year of the Program (Year 1), or the second year of the Program (Year 2).

In the discussion that follows, the cultural and social dynamics of the Metro community are explored and organized to present key recurring cultural themes revealed through ethnographic analysis. These include:

- Perspectives on concepts that define the community at Metro;
- Expectations and motivations of teachers, students and parents;
- Issues that relate to common goals for academic achievement and professional development; and,
- Key mechanisms of community building that study participants identified as important factors in maintaining mutual commitment to academic success.

The concluding sections of the discussion focuses on challenges that were identified by study participants who consider existing problems in terms of solutions, or who believe that perceived problems suggest that the Program is not working. These issues include:

- Improving communication and missed opportunities to engage in activities within the Metro community, including expanding opportunities with Learning Partners;
- Time pressures to meet expectations and consequent social impacts to the community as the school advances to year three of the program;
- Questions about commitment and involvement that contribute to weak community ties and social relations; and,
- Issues related to diversity and student self-segregation.

A note to the reader: these issues were identified during the study period, January through April 2008. It is likely that some of these issues may have evolved toward solutions and necessary change, and therefore may not exist at this point in time in the same way as described here. But, these issues can still be instructive in considering the evolution of the community at Metro, and in recognizing the value of the social and cultural context for problem solving that is described in this study more broadly.

In this effort, our research team had the cooperation and interest of many individuals at the school, with numerous volunteers stepping forward to participate in the study. Their expressed interest in learning about themselves as a group can be interpreted as further evidence of the deep involvement of teachers and students alike, engaged in a common endeavor to build Metro to succeed in ways that meet their needs. Some study participants commented that they thought the study would be helpful in learning more about the school so they can improve the Program and do a better job. Through their stories about their individual aspirations, the broadly held sense of Metro as a new and important approach to education, and through expressions of their personal hopes for Metro's success, we are given an inside view of what the Metro experience is about from their diverse perspectives. Exploring the cultural themes identified in our research provides insights on how the Metro community is defined by those who are involved, and sheds light on core cultural values associated with a sense of community that serves as the context for learning.

4.1 Defining the Metro Community

All interview respondents (N=32)[1], and all student questionnaire respondents (N=108), were asked several questions about the *concept of community* at Metro High School. These specific questions are presented in Table 4-1 (see Appendices B, C and D for complete set of interview questions for each group, and Appendix F for the Student Questionnaire).

Across all respondents, each affirmed the concept of a Metro community, and each was able to articulate a range of ideas associated with *community* and with *community building,* as well as to describe their role in the community both in terms of what they are actually doing to contribute to community building, and what they would like to do in the future. The latter was generally framed in terms of self-evaluation, or reflection on the differences between the ideal of the Metro community and their success in achieving the ideal.

For teachers who expressed sentiments about not being able to do more to build a strong community, comments generally included references to lack of time, as well as lack of opportunity for building social relationships with other teachers, staff, and with parents. With regard to teacher-student relations, half of the teachers interviewed said they had strong relations with their students. The picture changes significantly when looking only at Year 2 teachers (N=6), with only 1 of 6 teachers identifying students as their strongest connection at Metro (see Table 4-2: *Teachers Strongest Relations at Metro*).

Students and teachers agreed on the value and importance of strong student/teacher relations as a fundamental aspect of a good learning environment, with some students noting that it is important to work toward building friendships with teachers who are there to help them achieve and succeed. In the words of one student, "I try to find some of my other teachers that will give insight on ideas, politics, economics, music. Just general stuff; it's good to talk with someone who will both listen and give you feedback" (4066). Teachers who described the value of getting to know their students both in and out of the classroom regard the process of building friendships with students as a way to enhance their ability to teach to the individual needs of each student. One teacher commented that "the emphasis is on meeting academic needs and that requires knowing your students well, what they like, what they do on the weekends" (3011).

[1] In all instances 'N' refers to the total number of respondents

Table 4-1 CONCEPT OF COMMUNITY INTERVIEW QUESTIONS

GROUP	QUESTION
Teachers	How do you describe the concept of community at Metro?
	How would you describe the Metro community at this time?
	What is your role in community building at Metro?
	What is the role of students in community building at Metro?
	In your view are there others that contribute to community building at Metro?
	What are the strongest aspects of the community at Metro for you?
	What are the weakest aspects of the community at Metro for you?
Students	What is *the* concept of community at Metro?
	What is *your* concept of community at Metro?
	Do you actively participate in community building at Metro?
Parents	How would you describe the Metro community?
	How does Metro describe the "Metro community"?
	Is there a role for parents in community building at Metro?
	What is your role in the Metro community?
	In your view are there others that contribute to community building at Metro?
	What are the strongest aspects of the community at Metro for you?
	What are the weakest aspects of the community at Metro for you?

Teacher-to-teacher relations are also described as highly desirable, but not all teachers feel that they have the opportunity to build strong social ties among teachers. These issues will be explored further in later sections of this report. Of the 14 teachers interviewed, 64% stated that they felt they had strong connections with teachers within the same field (humanities/social studies), versus 50% of the teachers who stated that they also had strong connections with teachers across the humanities/science divide. Five of the 14 teachers (36%) also stated that they had a strong positive relationship with the school principal, and 14% noted the importance of their ties to the school's Administrative Assistant.

Table 4-2 TEACHER STRONGEST RELATIONS AT METRO

Teachers	Same Field Teachers	Other Teachers	Students	School Principal	School Administrative Assistant	Learning Partners
Metro Year 1[a] (N=8)	35%	21%	43%	29%	7%	7%
Metro Year 2[b] (N=6)	29%	29%	7%	7%	7%	0%
Total[1,2] (N=14)	64%	50%	50%	36%	14%	7%

[a]Year 1 teachers began teaching in Fall 06.
[b]Year 2 teachers began teaching in Fall 07.
[1]Note that responses to interview question, "What is your strongest connection in terms of relationships within the Metro community? (Question 17). Respondents were asked to name individuals who were important to them, and were not limited in number of people they could name, nor were they asked to rank them in order of importance, but only to list them. In some cases, respondents did characterize the most important connection, in other cases the respondent would name 2 or more individuals without commenting on their relative importance. Some respondents named a group and not individuals.
[2]All calculations are based on N=14, including for Year 1 and Year 2 calculations.

All parent respondents (N=6) identified the school's Administrative Assistant as their strongest connection to Metro. Parents noted the school principal and teachers as their next strongest link at 67% each, and half identified other parents, reflecting the nascent stage of involvement for parents. Parents also stressed the importance of having opportunities to get to know their child's teachers as part of understanding the needs of their child and how to provide support and encouragement at home. At least half of the parents interviewed described the role of parents at Metro as being involved through volunteering (classroom, field trips, clubs), participating in the Parent Teacher Student Organization (PTSO), participating in Town Hall Meetings, and staying in good communication with teachers and staff to support their efforts and the school generally. Two parents reported that they have helped to bring outside resources to the school including helping to identify learning opportunities to link students with the community outside the school.

Reference to the "Habits of a Metro Graduate" (Metro Habits) was also frequently included in the descriptions of community and community building by students and teachers in particular (see Table 4-3: *Habits of a Metro Graduate*). In our analysis, it is clear from both the perspective of the teachers and of the students, that the principles of the Metro Habits are intended to frame all social interactions and communications by Metro teachers and students, both within the classroom and outside the classroom. In this analysis, we find that those who actively seek to apply the Metro Habits articulate an awareness of the priorities implied by the Metro Habits, as well as demonstration of praxis in using the Metro Habits lexicon, and in explicit modeling of behaviors consistent with the Metro Habits.

The Metro Habits establish a shared cultural framework that defines effective communication, roles and responsibilities, and also signals tacit agreement to work together to achieve mutual goals. The Metro Habits also encourage practices that form the basis of a *recurring cultural theme* which is best described as *anticipating success*. The Metro Habits clearly define appropriate behavior in terms of achieving academic excellence (mastery, performance, engagement in learning), as well as for achieving social adeptness in effective communication which is necessary for engagement with a broad and diverse professional community. Students and teachers are both expected to model the Metro Habits in their interactions, instilling a sense of professional conduct, and creating mutual expectations for respectful behavior towards each other.

Table 4-3 HABITS OF A METRO GRADUATE

HABITS OF A METRO GRADUATE	
Critical Thinker	The student uses critical thinking skills to analyze, synthesize, and evaluate information and observations. (In-class assignments)
Inquiring Learner	The student asks questions which extend concepts and applications to create or discover ideas, products, or decisions
Collaborator	The student demonstrates effective collaboration, honoring diversity, appropriate interaction, and successful completion of task.
Communicator	The student presents his/her perspective in an effective manner that includes the consideration of the audience.
Engaged Learner	The student actively constructs meaning taking advantage of opportunities, actively speaking and listening, and demonstrating openness to learning.
Active and Responsible Decision-Maker	Students take ownership for their decisions by reflecting on their work, making adjustments, and evaluating their overall performance.

(McAllister personal communication 2008)

With regard to concepts of community, most Metro teachers and students describe the community as a strong and vibrant dimension of their involvement at Metro. One teacher described the community "as a whole group. We have [a] very strong [sense of] belonging. We all think we belong to Metro. It's an active and positive community" (3012). Among the 14 teachers interviewed, four (29%) referred to Metro in terms of "home," "safe," "close," and "caring." The majority of the teachers (57%), students (67%) and parents (100%) defined the Metro community as academically focused, and also expressed views on the diversity of the community that reflect "racial, socioeconomic, and academic" differences (5005). Strength of community in terms of diversity is also described by teachers, students and parents as an important characteristic of the Metro student body.

For parents, the idea of a Metro "family" includes a purpose that brings teachers, students and staff together to solve problems, and that there is a "sense of kinship" within the Metro community (5007). Words like "close knit," "tight knit" are also used by parents and students alike in describing the Metro community. Another parent commented that the Metro community is more like a family, saying,

> *[It's] a 200 person family, more than a regular school. You'll see a great involvement of parents, of the families, of the kids here. Part of that I think has to do with the [school's] application process. Every student that comes here [is here] because they wanted to — interested in it – had to make a conscious effort to apply and their parents supported it. So every student that's here is [here] because their parents were interested in it. Shows an above average interest by parents in the students' education. Since every student is motivated to be here, they have a far greater interest in succeeding here* (5007).

Considering that parent involvement begins when a student initiates the application process for Metro, it is apparent from this parent's perspective that many Metro parents are committed to Metro and do invest their

time and effort in different ways, and feel connected and committed to the success and purpose of the Metro program.

The idea of family also resonates across student views. Among students interviewed, one student stated that Metro is a place where,

> *Everyone helps each other. Like, we had a problem earlier in the school year, things with theft like at a typical high school. But that was resolved because our atmosphere is really good and everyone wants to be kind of like a family. Students call it the "Metro Family." I feel at home here, we all get along for the most part* (4003).

Among student questionnaire respondents, in response to question 10, 74% of 9th grade students said they think of Metro as a family, and more than half the 10th graders (57%) also regard Metro as "family like" or "like one big family." Similarly, just over half of the 9th graders (52%), and just under half of the 10th graders (43%) regard Metro as academically focused, but also noted the importance of good teacher/student social relations, as well as the opportunity to engage intellectually with other students.

The fact that many of the study participants described Metro as a family, adds a dimension to the definition of the Metro community that accrues from culturally familiar concepts of family. In effect, these ideas link the metaphorical values of family directly with Metro, providing cultural mechanisms for students and teachers with a familiar framework in which to work together to solve problems. A sense of family also suggests that Metro is a place where students can feel free to "spread their wings" and where trying, sometimes failing and sometimes succeeding, will be supported and accepted. These are all notions consistent with the concept of family that provide students with a sense of permission to push beyond their "comfort zone" to extend their abilities through mentoring by teachers who they trust, and by working jointly with students who share a desire to academically succeed individually, as well as together, in a nurturing, caring, close-knit environment.

Invoking the notion of Metro as a family involves a *cultural schema* where the meaning of the word is understood through common cultural experiences that do not have to be explained (D'Andrade 1992). In this case, expressions of family connote both positive feelings about being safe and being nurtured, as well as potential for discord and disagreement that are normal among family members, but whose commitment is nonetheless anticipated through expectations that family bonds will hold family members together. Family bonds also connote a sense that problems will be faced together, and that everyone has a role to play in finding solutions to apply to problems.

The Metro High School campus also reinforces a "small school" environment where students feel strongly about the value of being able to know everyone in the school, and where the space itself is open and designed for multiple purposes and uses that range from classroom instruction to socializing at different times of the day within the same physical space. Morning sessions held in the common area at the entrance to the school start the day as a way to provide new information to students. One student stated that morning session is a time when "everyone has to come to the front of the building each morning, it's not just on TV. All of the desks are in a circle and you're not just facing the teachers" (4084).

One teacher commented that the school building design is about trust and openness. "I think the idea is it's an open floor plan [that] teach[es] the kids to trust each other, their surroundings, open cubbies, so they don't steal. All the windows, nothing is secret. You can know exactly what's going on at any given time" (3011). One student questionnaire respondent said he regards the Metro space as "modern but with a feeling of trust and openness" (B209), and another said the Metro atmosphere is "like a business with many expectations" (B211). The idea of Metro as a small school has appeal for students, with 20% of 9th grade

and 19% of 10th grade students saying they like the small scale of the school, the openness and also describing it as a safe atmosphere.

The multiple-use design of the school lends itself to a dynamic and flexible atmosphere that some regard as exciting and conducive to socializing and well as learning. The multiple function dynamic of the Metro facility is mentioned by some students who say that the fluctuations that occur throughout the school day adds to the challenge of being able to focus on classwork, noting that classes are sometimes changed from one space to another on short notice.

4.2 Expectations of the Metro High School Program

Learning about the Metro community from the teachers, students, parents, staff and others engaged in the school allows us to ask questions about the choice to join Metro for both teachers and students. The questions posed to teachers, parents, and students concerning ideas about what they initially thought about Metro and what they think of it now, reveal personal motivating factors and expectations about the Metro Program that provide essential understanding of the diversity of interests, values and priorities of the student body, parents, and school faculty.

Among student interviewees, 25% stated that prior to entering Metro, they believed that Metro would be a math and science program for "smart kids" that would require an accelerated pace as part of the requirements. After being at Metro, half of the same students commented on the accelerated pace, and 25% said that they thought the students were smart and nice, and 42% thought that Metro provided a lot of opportunities.

By comparison, student questionnaire respondents show variation by age and sex (N=108) that provides further definition on these issues. Responses to question 3 of the questionnaire, *What was your idea of Metro High School before you came here to be a student?*, and question 5, *What is your idea of Metro High School now?*, show different patterns across grade and sex and suggest a strong level of interest in academic achievement across all groups. Both 9th graders (N=54) and 10th graders (N=54) said they thought Metro would be the best option for a better education (26% of 9th graders, and 26% of 10th graders) and that the accelerated pace of the program (17% and 20% respectively) and opportunities for early college entrance (30% and 20% respectively) would be gained from the Metro Program. When comparing 9th graders with 10th graders, 19% of 10th graders said they came to Metro because of their interest in STEM, the challenges of the program, and expectations that the program would be new and provide a different type of learning experience, while only 9% of the 9th graders came because of the STEM focus. In response to the question, "Why did you choose to come to Metro?" one student interviewee responded:

> *At first, I felt because Metro didn't have sports and focused on engineering, it wasn't the school for me. I wasn't sure I wanted a career in engineering. But at my old school, I felt most students weren't there for academics, [they were there] just to make friends. The curriculum was structured in a way that would let you pass without doing [the] work. I felt Metro would challenge me which was what I really needed* (4016).

In comparing female student questionnaire respondents (N=46) with male students (N=62), similar patterns emerge with a few exceptions that distinguish the two groups. Both males and females said they came to Metro because it was the best option for a better education and future (26% for each group) and because of the early college entry opportunity (24% of females, 26% of males). The female students thought that Metro would give them more opportunities (20%) while 13% of the males thought the Metro Program would provide a unique and innovative learning experience, with 15% of the males identifying the school atmosphere of the facility to be a plus. One difference among males and females reflects 9th grade female interest in a small school atmosphere (9%) compared with 10% for 9th grade males. No 10th grade female

respondents noted this feature of Metro, but 19% of 10th grade male student respondents said this was an important aspect of the school. Among female student respondents, 9% of the 9th and 10th graders also value a friendly and diverse student body as being important reasons for choosing Metro High School, as compared with only 3% of the 9th and 10th grade male student respondents.

Students who participated in the questionnaire were also asked about who made the choice to attend Metro High School. The majority of both 9th graders (61%) and 10th graders (61%) said they made the choice to attend Metro High School. A smaller percentage, 28% and 22% respectively, said their parents also participated in the decision to attend Metro. Among 9th graders, 11% stated their parents made the decision to attend, and 17% of the 10th grade respondents said the same thing. Taken together, the percentage of parents reported involved in the decision to attend Metro rises for 9th graders to 39%, and for 10th graders, to 39%. The level of parent support is important because the commitment made to Metro involves both students and their families in different ways. Because parents are required to participate in the application process to the program, and are also active in the student interview process, it could be fair to assume that the commitment of parents to the Program is also strong across the 61% of students who reported that they alone made the decision to attend the Metro Program.

Teacher responses to the interview question about choice to join the Metro faculty presents a less complex, but equally important picture to gain an understanding of motivation, values and priorities for choosing Metro High School. The opportunity for professional development, STEM focus, the collaborative framework of the program, opportunities to work with motivated students, as well as opportunities to contribute to innovative teaching methods were reasons given by 79% of the teachers, with the remaining teachers citing personal reasons for choosing Metro, or uncertainty about their teaching position at the time they applied to Metro.

With an understanding of expectations and priorities expressed by students, parents and teachers entering the Program, we can now consider the range of issues identified in describing views on what they think about Metro now, and if Metro is meeting their expectations.

4.3 Does Metro Meet its Mission?

Across the group of students, parents and teachers interviewed (N=32), views on whether Metro is meeting expectations range across a wide set of variables which will be discussed throughout this section. For purposes of gauging general views on whether Metro is meeting expectations, we analyzed individual responses as to the positive and negative issues raised within the interview as a whole, and identified statements indicating the perception that Metro is "evolving," or as a number of people described it, that Metro is "a work in progress."

It is not surprising to see that a third of the teachers view Metro as "evolving." This is likely due to the fact that they are clearly carrying the greatest burden in implementing Program goals on a daily basis, engaging with students, parents, administrators and Learning Partners. They are also at the center of conducting the everyday activities of Metro both in and outside the classroom. It is also important to note that the teachers who feel Metro is not meeting its mission are teachers who also cited high expectations for professional development, with one teacher specifically noting the opportunity to teach in a math program, and one teacher commenting on the chance to teach highly motivated students as opposed to less academically oriented students. This suggests that teachers expect goals to include growth and development for both teachers as well as for students as part of the Metro Program.

Statements from interviewees about Metro meeting expectations were made in response to questions concerning before and after perceptions about Metro, e.g., *What did you think of Metro before you came,* and *What do you think of Metro now?* A surprising number of individuals across all groups described their

before and *after* views of Metro in terms of whether or not Metro is meeting goals based upon what they expected, as well as what was represented to the community (in the media, at presentations). Teachers, students, and parents alike point to academic goals, as well as social aspects of the school's development as key factors of gauging success. In describing the view of *Metro now*, one parent stated:

> *After basically a year of being here, and being part of the Metro community, my opinion hasn't changed. Rather the justifications for my earlier opinion have been reinforced. The Metro school has shown itself to be a large family. I can't really, I don't really see any better way to describe it* (5007).

Another key factor is the progress of the school in its first two years. Many interviewees commented on the differences between Year 1 and Year 2 of the Metro Program, saying that the school is improving, but also expressing a belief that as it expands it is more challenging to meet the needs of more faculty and a greater number of students. One teacher commented,

> *I think it's a school that's well on its way to being excellent. I think we're a lot of things to a lot of people, and we have a lot of roles to fill. I think we're doing great with some of those roles, and some of them, it feels like we could use more time with. Over the next few years we'll be able to get our feet set* (3009).

Among the 14 teachers, five thought Metro's first year was a better year noting that there was more time to get to know students, easier to coordinate a smaller group of teachers and students, and that there were more opportunities for field trips. A smaller group of teachers (3) thought Metro's second year was better. Reasons cited include working with a larger group of teachers makes it harder for individual teachers to resist new ideas, and as one teacher noted, there is mandatory collaboration for teachers that wasn't in place in Year 1 which has increased the opportunity for dialogue across subject areas.

The expectation of success, in effect *anticipating success*, is a primary recurring cultural theme that bears further exploration in terms of what constitutes success. Considering the expectations of students, parents and teachers as they entered the Metro program and what they believe about *Metro now*, is one dimension of describing how those involved at Metro "buy in" to the Program, a phrase frequently used by students, teachers and parents. It is also a useful cultural schema to gain an understanding about how anticipating success guides each individual's level of participation, commitment, and growing engagement in defining success for themselves, and ultimately, for Metro. The *commitment to success* is a cultural schema that incorporates key factors that form a bond between teachers/students/parents/staff, creating a shared cultural enterprise that is encompassing of diverse and distinct goals. These factors include personal aspirations and ideals for career and professional development that are linked through Metro to Learning Partners and their resources for advancement in a shared endeavor that maximizes the opportunities provided by Metro.

These cultural themes are reflected throughout the study in terms of views expressed by teachers/students/parents/staff, and in the following sections are explored further to provide insight on the various interrelationships between the academic and the cultural domains that form primary components of the Metro experience. The latter part of Section 4 also explores issues that illuminate aspects of the Metro Program that may present obstacles for teachers and students in ways that prevent maximizing opportunities and responding to unmet expectations.

4.4 Development of the Metro Community: Constructing the Metro Culture

Modeling of Metro Habits is a goal shared by both teachers and students, many of whom expressed some sort of self-assessment as to measured progress with achieving behavior consistent with the goals espoused by the Metro Habits. The Metro Habits lexicon is also evident in talk about behavior and attitudes among

Metro students and teachers. Use of the Metro Habits lexicon reinforces desired goals and signals tacit agreement on important attributes associated with a Metro student as well as a Metro teacher. In other words, the Metro Habits define appropriate roles for students and for teachers in new ways. As one teacher noted,

> *At a big school, you are just a number, here everyone knows you. In Advisory, we talk about being responsible for yourself and others. We are one family. One community. We also try to communicate this to students. We share a common language, this kind of thing* (3012).

Integration of academic skills with social skills is fundamental to Metro Habit concepts, and is invoked by students and teachers when they speak about their priorities, and when they describe expectations of one another. Key cultural themes expressed within the Metro Habits reflect values for demonstrating *responsibility* and *accountability* between teachers and students, between students and students, and generally in all actions related to the broader Metro community (staff and Learning Partners). Issues related to *leadership* also require that a student demonstrate a commitment to initiating personal effort and engagement in the Metro Program. A key aspect of the Metro Habits also derives from tacit demonstration of a student or teacher's best efforts at modeling the Metro Habits in social interaction that supports seeking learning opportunities, using good judgment, respecting diversity, and expressly showing consideration of others.

Establishing *trust* is also a key aspect of Metro that is identified by interviewees as a fundamental principle for academic engagement in the school, as well as an essential element of friendship-building processes between teachers, between teachers and students, and between students and students. In part, we can consider the ways in which the Metro Habits provide a code of conduct that leads to knowing what is appropriate interaction. This creates expectations that students and teachers will treat each other with respect, essentially establishing trust between individuals who expect that each will follow the rules. The social setting at Metro is another dimension of the sense of community and trust-building rooted in the small scale of the school itself, providing opportunities to develop personal ties and friendships with teachers, staff and students, unlike larger high schools where students may only get to know a small number of their classmates. The small school atmosphere enhances the prospect of getting to know each other, and the idea that "since it's a really small school, everyone knows everyone, maybe dislikes some of them – but everyone knows everyone, which I like a lot" (4118). Among student questionnaire respondents, 19% of 9th graders and 24% of 10th graders said that the closeness of the student body and friendly atmosphere among students are among the things they like most about Metro.

Key to almost everything that occurs at Metro is the practice of *collaboration*. Working within a collaborative framework means engagement in the Metro learning process. If you aren't actively participating in classroom projects, Service Learning Projects, or extracurricular projects, then you are not only failing yourself, but you are also failing fellow students and teachers who are relying on a team effort and involvement of others to create the collaborative process essential to achieving Mastery, meeting goals for Service Learning Projects, and ultimately maximizing opportunities for career development offered through the Metro Program.

4.4.1 Responsibility and Accountability

Teachers and students both point to the importance of taking individual responsibility for meeting goals and priorities, as well as for holding each other accountable for meeting commitments and conducting themselves with respect for others. Acting as role models for students, teachers effectively demonstrate the value of following the Metro Habits by demonstrating moral behavior, respect for others, good decision-

making, and actions that help to build essential social bonds that establish a sense of community. However, as one teacher explained,

> *Metro is an experiment whose time has come. [It is] much different and deeper than my original notions. In some ways there are parts of Metro I'd like to strengthen. NPR [National Public Radio] has called us a national model for good reason. There are things we can do a better job on. There are things in Metro's philosophy that are hard to teach. It's hard to teach philosophy of being nice and respect. Easy to say, hard to do. That being said, I'd rather be part of a solution even if tilting at windmills* (3003).

In terms of strengthening these practices as Metro grows, one teacher expressed the view that this is something all the teachers are willing to work toward:

> *I would say this community is a very positive thing. And we expect everyone to take their responsibility toward this community. It's also a very active community. It's on track. And it will get better next year, we have some problems and we are working on that. Some issues often come out and all the teachers are working on that and we believe it will be better next year* (3012).

Students and teachers both consider accountability an important part of the student-teacher relationship and as described by one teacher, "Students hold teachers accountable for their work. [They are] the accountability police, very vocal. If they felt a grading practice unfair or a mastery assignment not measuring what it is supposed to, they'd say it. They are not afraid of discourse" (3001). Teachers also think that there is a student accountability issue where issues of trust are concerned. The example of recent vandalism in one of the school restrooms elicits the observation by several teachers that students are failing to hold each other accountable for their actions, choosing to remain silent on the situation rather than engaging more fully in speaking out about the problem, and finding ways to curb the behavior amongst themselves.

One parent, in response to the question, *What do you like best about Metro?,* said that the Metro Program gives the students and teachers a chance to do their best, and to be responsible for their own learning. This parent said,

> *[I like] that learning is exciting [and] that the students are responsible for their own learning. They're held accountable. There's no hiding because the classes are too small, or small (laughs). [I like] that the pace is faster. The many field trips, the internships, the college visits. I like that the class time is longer. The science lab is awesome. The chemistry lab. Your caring teachers. Not that all schools don't have caring teachers, but I think this environment allows them to be at their best* (5006).

4.4.2 Trust

Student respondents primarily identify trust issues as basic to their ability to work closely with teachers, as well as essential to building friendships with teachers and with other students. For some students, trust is the basis for feeling comfortable about asking for help with problems at school, encouraging them to establish close ties with teachers who can mentor them through steps toward overcoming hurdles in progressing in the Program. Other students equate the sense of trust that they feel at Metro with a "trustworthy environment" that adds to their experience at Metro. Trust was also an issue for one student who commented that Metro is a place where "I feel that everyone should be able to be open with each other" (4016).

Issues of trust are also reflected in comments about the Metro facility. The design of the school includes common areas shared by all students, and open access to all rooms. The student "cubbies" where students store their possessions during the course of the school day are another feature of Metro that is often mentioned by students as a "symbol of trust." This trust-based system, which some feel has been violated by recent thefts that have occurred, presents a dilemma for students and teachers that some feel is not being addressed and needs more attention. As one parent noted, "some in the [Metro] family are not getting the word about being trustful" referring to problems associated with security of possessions within the Metro facility (5003). However, in general, the open floor plan is an important feature of the Metro experience that does convey transparency of activity, and as described by one teacher, "nothing is a secret, you can know what is going on at any given time" (3011).

4.4.3 Collaboration

Collaboration is one of the six Metro Habits and is a fundamental principle of teacher-to-teacher, teacher-to-student, and student-to-student interaction. The multiple ways in which collaboration is viewed by teachers and students not only reflects the essential importance of collaboration to the academic endeavor, but is also recognized by teachers and students as either: 1) a process that *builds* social relationships, or 2) a process that is *built upon* social relationships. This dichotomy, while seemingly at odds, reflects a value for the importance of working closely together through social relations whether new or established. One teacher described it this way, "At Metro we try to push the concept of collaboration as a way to enrich and deepen personal and working relationships" (3003).

For teachers, collaboration represents the communal framework that supports a full slate of essential interactions and is based upon a set of relationships that one teacher described as,

> *Teacher to teacher, student [to] student, teacher [to] student, student [to] community, and all that. Partner [to] teacher, partner [to] parent. And [also] Metro with many different organizations. So collaboration is all of that. Collaboration to me means face-to-face. I could mean using technology, through emails, distant learning. There are many forms of collaboration. I think the goal for collaboration is to exchange ideas in order to build a successful product or get a point across* (3013).

Effective collaboration in this sense provides the glue that builds community through common sense of purpose, and shared values for "working together" to solve problems, to making things work better both in terms of academic endeavors, as well as in problem solving of all sorts. The theme of *working together to solve problems* is a cultural theme that also characterizes the social bonds that some describe as the "Metro family" discussed earlier in this section.

For some teachers, collaboration provides the key to expanding their professional capacity. Collaboration also offers the opportunity to grow through exposure to the pedagogical strengths of their colleagues, both through an interdisciplinary framework (integrating the sciences and with the humanities), as well as through working jointly with teachers within their subject area. For these teachers, collaboration provides the platform upon which to develop team-teaching projects, course curriculum, and other innovative "out of the box" approaches to teaching at Metro.

Across the 14 teachers, nine reported being engaged in some form of teacher-based collaboration, although there is a range of views about the effectiveness of collaborative efforts. For some teachers, a huge constraint on effective collaboration stems from lack of time to engage more fully. For others, there is a distinct social barrier to working more closely with teachers, citing a lack of social relationships as a constraint on working with other teachers.

Of the nine teachers that describe collaboration efforts, five cite teacher-to-teacher collaboration, whether first-year to first-year teachers, or first-year to second-year teachers, as helpful to their work. Fourteen percent of the teachers note that effective teacher-to-teacher collaboration, including work with the principal, is essential to modeling collaboration for students who are required to collaborate on projects. One teacher noted that collaboration between teachers and students includes a fundamental dimension of the Metro Program that requires that teachers and students "work together for the same goal of learning" (3012).

Students also recognize the different types of collaboration and the different values associated with the range of purposes that drive collaborative interaction. One student commented,

> *My concept of community at Metro is more of students [who] are learning together and also teaching each other. We have teachers here, but a lot of learning we do, we do through community. If you can teach someone else what you've learned, you've mastered it* (4110).

For this student, the teacher/student model of collaboration provides a familiar frame for students where teaching/learning forms the central interaction between two individuals. For Metro students, taking the role of teacher is also something familiar and acceptable to students, and is respected and regarded as an achievement by students and teachers alike.

4.5 Shared Goals: The Social/Academic Framework for Success

Anticipating success among teachers, students and parents is part of a shared vision on outcomes for students and for teachers that centers on the importance of academic excellence, as well as the value of social growth and development as integral to academic outcomes. When describing the Metro community, teachers, students and parents frequently referred to Metro's social environment as an important aspect of growth and development. As one teacher described it,

> *I guess we, I believe we have a desire that everyone feels like they belong and go to great lengths to help people feel they belong here. This is a safe place. This is home. The concept of community, that we're all in this together. That we can help each other succeed, or we can help each other fail* (3008).

Reasons for choosing Metro discussed earlier shows that there is a strong interest in the academic focus that Metro provides for teachers as well as for students. This shared focus on academic development among teachers and students increases expectations of each other that are defined by the Metro Habits. These include expectations that students will demonstrate self-discipline in applying effort towards progressing in the Program, that each will participate fully in projects and classroom assignments, and that they will maximize learning opportunities, and initiate problem solving strategies utilizing human and technical resources when confronted with challenges.

The student questionnaire revealed another trend among students who stated their interest in joining a school where they could fit in with other "smart students." In other words, they view Metro as a place where learning and achieving are a shared value, and there is a tacit agreement that students are free to work toward their maximum intellectual potential. As one parent put it, Metro is a, "safe place where you can spread your wings and grow in ways that you may [not] have [otherwise] because they encourage you to do that here. It's challenging and it's exciting" (5006).

Several student interview respondents commented that they came to Metro for the challenge (4066), and the idea that they could engage in learning vs. memorization (in contrast to traditional high school experience) (4084).

> *I really like the two-hour classes. It makes it a lot easier to get into the topic that we're studying. I like how we're able to make up assignments and you're not handed a book and expected to memorize it. It's more interactive and interesting* (4055).

Students and teachers were also inspired to become part of Metro because it is something new and innovative. Among student questionnaire respondents, 9% of 9th and 10th grade females said they were interested in Metro because they thought it would be unique and innovative. Tenth grade males were highest at 19% in their interest in Metro for its innovative approach to learning, as compared with the low of 6% for 9th grade males. Nine percent of 9th and 10th grade females also said they chose Metro because of the challenge of the accelerated pace of the program, as compared with 23% of 9th grade males and 29% of 10th grade males.

Students and teachers also feel a sense of pride about the Metro Program and also state that the support and association with the Learning Partners and with the greater Columbus community is unique to Metro High School. One teacher noted the importance of visitors to Metro, who come to visit the school to meet with students and teachers to see for themselves what Metro is about. "I guess they have bought into it, if they see something successful [and] they want to support it...If we're successful, everyone feels that they're successful" (3013).

An important dimension of the everyday life of the community derives from the fact that Metro is a "demonstration school" and consequently is under constant observation by visitors that range from dignitaries, to educators, to Metro parents who are encouraged to drop in to observe their child's classes on an open basis (1005). For one teacher, the idea of a constant flow of visitors to the school was initially distressing, causing the teacher to feel pressure about student performance and that students would also feel pressured to meet expectations of the school. In fact, this teacher stated that she now considers the idea that people from outside Metro are interested in seeing the school and in meeting students and teachers as a positive aspect of Metro, resulting in increased confidence that both teachers and students strive to be their best at all times, not just when visitors are present.

> *I think this is a very open school. A demonstration school. Everyday we have a lot of visitors and a lot of guests. Now I feel comfortable when people step into my classroom. They don't disturb me. Because this is a demonstration school, I want myself and my students to perform* (3012).

Parents and students are also involved in talking about Metro to the Columbus community during the school year for various purposes, including new student recruitment, and as part of the process of getting the word out about Metro. For some students and parents, the purpose of their message is not only about the school itself, but it is about sharing Metro High School with the outside community, instilling a sense of Metro as part of the larger Columbus community.

As one teacher put it,

> *The students are, most of them, are very engaged and they want to learn, they want to be here. They're well behaved. Their attendance is excellent. They always volunteer and they want to show off their school. Not only teachers, but students see the school as not only theirs, but everyone's. Even the [Columbus] community. And they really want everyone to learn about the school* (3013).

This teacher went on to say, getting the word out about Metro is also about gaining support and bringing resources to the school and in part is accomplished through the Service Learning Projects required for all Metro students. "…I think the kids, their role is to let other people know what Metro is all about. Since it is a new school, they need to get more people involved…" (3013)

One parent considers the role of parents to include functioning as "…ambassadors for getting the word out as far as sharing what we experience at Metro with other people…" (5005). Another parent agrees with the importance of those from outside Metro who can contribute to the Program saying,

> *Just about every parent, every adult that walks through this door has knowingly or unknowingly contributed to building the Metro community. Some do it by deliberate actions or things that they take on, or do or say…everyone contributes* (5007).

From the responses of teachers and students, there is consensus that the Metro message is about achieving academic excellence. Metro teachers and students have entered into a bond to work together in support of their individual achievements, but also as part of a community of individuals who rely on each other to successfully engage in learning, from classroom assignments and projects, to problem solving and decision making about the day-to-day business of the school. Of all the topics and issues raised throughout the interviews including those of the parents and among the student questionnaire responses, a recurring cultural theme emerges from those who express "excitement" about being part of something important and belief that Metro is about the *future of learning*. As one student explained,

> *I really like the idea of something different, something new. We're kind of the guinea pigs. I like the privilege of trying out these new ideas. I like that we're so well supported in many things. OSU backing, [and] Battelle backing us. [Being] an early college high school. My favorite part is that it doesn't just stop. There's this new conference, new technology, we can get a grant, start this club, that club. We're always moving forward. We want to gain new ideas, new knowledge, and new ways of teaching.* (4055)

Sharing a desire to be involved with something new and unknown and taking part in building the legacy of the Metro Program may form the most distinct aspect of the Metro Program. This occurs both from the perspective of the teachers as well as students, and also from the perspective of those outside the school who are invested in the success of Metro that includes Battelle, OSU, the PAST Foundation and the other Learning Partners, and the greater Columbus Community. Being involved in something *new and exciting*, taking part in what students and teachers perceive to be the *future of education*, and shared values that *anticipate success* are all part of the message uniting the Metro community that also provide a sense of a Metro identity.

The fact that Metro does not encompass typical traditional high school events such as sports and pep rallies that are often the source of school unity or focal point for school pride, suggests that Metro students have "bought in" to a different type of identity. As one parent noted, a choice to attend Metro meant giving up music, art, theatre, sports, but also provided the opportunity to gain from the academic emphasis the Metro Program places on the STEM focus, Mastery, and the accelerated pace of learning.

As the first two years of the Program reach conclusion, the *whole* is clearly more than the *sum of the parts*. As one student said,

> *I thought that they wanted all their students to become engineers. If you weren't interested in STEM, you shouldn't come here. Now I feel my eyes are open to the other options* (4016).

Preparing to become part of a future world of professionals working in natural science and social science endeavors, active engagement in and commitment to community, and taking responsibility for making things work are as much a part of the Metro Program as the STEM focus. In the next section we will consider how these ideas are actualized through involvement in various Metro activities outside the classroom.

4.6 Mechanisms That Achieve New Priorities

The Metro Program offers a range of learning experiences for students that provide opportunities in which to apply new concepts and skills. Students are expected to engage in self-initiated efforts that lead to decision-making about the type of learning projects they want to undertake, and also play an active role in governing the school through the Town Hall Meeting process. Students have also taken the initiative to explore personal interests, forming after school clubs where they have the chance to pursue music, writing (e.g., journalism), as well as to continue their math and science interest (engineering club). These aspects of the school Program are key to understanding the total life of the Metro community, and provide a view of the ways in which Metro teachers and students engage in activities outside the classroom that contribute to a sense of community and build social relationships that link with a range of shared goals.

4.6.1 Applied Learning Opportunities

Applied learning requires engagement by students with teachers and other students, as well as with other adults, including Learning Partners whose interests vary. In this way, students are exposed to early experiences in conducting social interaction with others who possess a range of skills, talents, and priorities. In addition, students gain in extending social skills in communicating with others, showing respect, leadership and self-initiative, as well as demonstrating the ability to work collaboratively with others, all of which are essential aspects of an effective learning experience. For some Metro teachers, the applied learning component of the Program provides a core mechanism for creating a sense of unity among diverse students, and contributes to a sense of a Metro identity. Some teachers note that this seems strongest for students who participate in field study programs. One teacher commented, "…I think the summer programs that PAST and OSU have done, smaller groups, the unity that's developed there does come back with them. If we could expand upon and develop that, that would be wonderful" (3007). For another teacher, taking students out of the classroom contributes to community building because it gives students a different perspective on what community means. This teacher stated,

> *...whenever they do these field trips, summer camps and the field trip to China, I think that really helps to build more of a larger community than where we live, go to school. More of a world view, other cultures, other places, visit other schools. A lot of these kids may not have any travel experience outside the state. [This] gives them a bigger perspective of people, culture, foods, ethnicity, language, race* (3013).

Teachers play a critical role in developing and conducting learning experiences outside of the classroom and also see the value of the applied learning process for students that accrue on several levels. One teacher said that it is the teacher's role to create those opportunities and stated, "I'm always looking for outside resources to get a different perspective into my classroom" (3013).

The role of the primary Learning Partners, including Battelle, OSU, COSI and the Past Foundation, is prominent for teachers, students and parents alike. In response to the question, *What do you like most about Metro High School?*, 30% of the questionnaire respondents identified the opportunities, including trips, working with Learning Partners and the "hands on" learning approach.

When asked to describe the Metro community (N=32), in addition to naming teachers, students, parents and staff, over half of the interview respondents named both Battelle and OSU as members of the Metro community, and 31% named the PAST Foundation. The Education Council and the Columbus Business Community were each identified by 16% of the respondents (see Table 4-4: *The Metro Community*). There is awareness of the role of the Learning Partners and a sense that their involvement is key to Metro's success. As one teacher explained, the Learning Partners, Battelle, OSU, the Ed Council, "They set a top down model. [They give] structure to help this place succeed…" (3003).

TABLE 4-4 THE METRO COMMUNITY

	Battelle	OSU	PAST	Ed Council	NSBE Regl. Coord.	Business	Outside Community	Other
Parents (Q11)	3	4	2	2	0	0	1	
(n=6)	50%	67%	33%	33%	0%	0%	17%	
Teachers (Q14)	5	8	3	2	1	0	2	CES; Gates Foundation
(n=14)	36%	57%	21%	14%	7%	0%	14%	
Students (Q 22,23)	8	7	5	1	2	5	0	Gov.; Mayor; Col Art Mus; COSI; 2012 Conf;Col Zoo.
(n=12)	67%	58%	42%	8%	17%	42%	0%	
Total	16	19	10	5	3	5	3	
(n=32)	50%	59%	31%	16%	9%	16%	9%	

4.6.2 School Governance

Active involvement in shaping school policy is expected of all students, parents and teachers through the Town Hall Meeting process that is held once each trimester. The rules of engagement in Town Hall are based on a democratic process where any individual can submit a warrant proposing consideration of a new Metro policy for vote by those who are present at the Town Hall Meeting. As one teacher described it, "…we take input from parents, but the students are setting policy at Metro. No one's ideas are off-limits or off the table. You probably would not find that latitude in many schools" (3015). The importance of student participation in the Town Hall meeting is also an essential component of taking responsibility for problem solving through participation in a democratic process in ways where, "…everybody has a say. Everybody can impact what you're going to do. Not just teachers, [but also] students or parents. Equally -- parents, students and teachers. A student's voice is equally as important as [a] teacher's voice" (4052). Giving equal voice to students, parents and teachers in this process is important and noted for several reasons. First, parents say that Town Hall offers them a formal role and place in the community, and second there is recognition that students are gaining valuable lessons in learning to participate in the school's democratic process.

Another key feature of the Town Hall process is the opportunity to build a sense of equity among teachers and students, and therefore to instill equity in taking responsibility for solving problems both in and out of the classroom. Several teachers commented on the importance of student participation in the democratic governance of the school as a major aspect of building community. With equity comes responsibility, accountability and empowerment for students in conducting themselves with respect for other students, their teachers and parents. Both students and teachers agree that participation in Town Hall Meeting is fundamental to being a successful Metro student and fundamental to establishing a vibrant community life where issues are aired and debated in the school's "public square."

4.6.3 Extracurricular Activities

One important development initiated by students has been the formation of after-school clubs. One teacher described the formation of clubs as, "…really wonderful. I think the kids will take it any direction they want to. Sports, dances. I particularly want to see development of intellectual groups. When there is a demand for it, the kids will create it. That's what's wonderful about Metro" (3003). Another teacher stated, "I think the clubs are big. I have a passion for kids to bring the totality of who they are to school. Their passions, vitality, giftings. I want to provide them opportunities to bring that [to Metro]" (3009). Another commented that,

> *…it's very important for kids to have all these clubs, dances, extracurricular activities. It gives them an outlet beside the academics to meet students other than in their classes. They're friends, and they can have things to do that they have in common. [It] reinforces what they're learning* (3013).

While the club activities require sponsorship by teachers, and sometimes involvement of Learning Partners and community volunteers including parents, the effort seems justified to those most involved. Clearly the burden falls on the teachers to stay involved with students following the end of classroom instruction when clubs meet, extending the work of teachers and the length of the school day, and competes with teacher time needed for curriculum development. Both teachers and parents commented that the clubs should be formalized in order to provide organizational structure that will ensure each club, once established, will be supported from year to year allowing clubs to grow as Metro grows.

Comments describing the value of the clubs for students, the importance of clubs as a place for students to develop socially, and to have opportunities to build friendships outside of the classroom reflect the idea that clubs are another essential mechanism of community building recognized by students, teachers and parents. General consensus on the benefit of the formation of the clubs was expressed by all the parents interviewed. All agreed that the clubs were necessary for reasons of social development, and establishing friendships including a way to strengthen the Metro community to overcome the geographic diversity of the student body. One parent described the clubs as, "a good idea, because it helps strengthen the community. The Metro Community. Because we have kids from so many different high schools, school districts, that we need to bring them together" (5006).

4.7 Anticipating Success: Buying in to the Metro Program

Many of the respondents were careful to point out that Metro is still growing, and in its second year has a lot of work ahead to fully establish the various components of the Program that will meet all the needs of the first Metro High School graduating class. With that understanding, many of the explanations provided were often prefaced with the idea that Metro is a *work in progress*, characterized by such phrases as "we're ironing out the kinks," and the school is experiencing "growing pains." Such phrases indicate anticipation of improvement, and suggest that Metro is headed in the right direction, even if all the pieces are not quite in place.

Table 4-5, *Does Metro Meet its Mission*, shows that teachers who hold the perspective that Metro is evolving, when combined with those who think that Metro is meeting its mission, together are clearly in the majority, leaving a small group of teachers who have concerns that Metro is not achieving program goals. Comments by teachers, students and parents who don't believe Metro is meeting its mission will be explored in a later section, *Factors that Affect the Metro Community.*

An important dimension of the Metro Program is the principle of collaboration as a fundamental tool for achieving Metro goals. Those who think the Metro Program is effectively evolving toward academic

excellence are likely to invest their efforts in meeting Program goals because they believe that Metro will achieve its goals. Commitment to the basic tenants of the Metro Habits is an important aspect of effective collaboration, supporting the development of a *culture of collaboration* that is engendered in the Metro Habits and is something that teachers and students strive to attain.

Table 4-5: Does Metro Meet Its Mission?

Group	Yes	No	Evolving
Students (N=12)	75%	25%	0
Parents (N=6)	67%	33%	0
Teachers (N=14)	43%	21%	36%

In speaking about collaboration between teachers, between teachers and students and between students, there is awareness that to be effective in the Metro Program, students and teachers alike have to rely on one another to accomplish their goals. Emphasis is on doing your part and working together, that is, being a student who engages in projects, one who participates in the Town Hall Meeting, and one who joins in extracurricular activities, in an effort to maximize the Metro potential. One student stated, "I guess [it is] just everyone working together to get Metro to be what they feel it should be" (4016).

The potential for Metro to be successful through collaborative relations within the school requires that teachers and students embrace collaboration as a central principle of interaction and engage without fear of failure. As role models, teachers are keenly aware of the importance of demonstrating effective collaboration. Teachers working with other teachers and with the school principal are aware of the importance of their actions in providing role models for students. "We try to work together to see what we can do for our students and have a rich experience to tie in with their academics. All the teachers stay after school, most of us stay until 4 or 5 [pm], some even later" (3013).

Creating the right environment for effective collaboration also requires that teachers establish opportunities where success and enjoyment can occur, and where the teacher understands the importance of working to support each student. "I serve as a teacher who works to help every single student [who] wants to be a part of Metro to succeed and do well here. It's a school of choice" (3006). In another teacher's view, the general framework of collaboration is one that is "…desirable, beneficial, valuable. The [kind of] collaboration [that] we all think is a necessity to really be innovative and do the innovation we want" (3007). In other words, collaboration is about maximizing the learning process in ways that achieve both a satisfying and creative experience, as well as one that meets required performance of academic goals.

A number of students also point to their Advisory Group where students and teachers work on almost everything together, fostering collaboration to fix problems, develop community projects and generally work on the student's goal-setting and overall progress. Ideas about *working together* form a recurring cultural theme that gives shape to a sense of community where individuals join in the common effort of finding the right way forward. For students as well as for teachers, this process is integral to their own professional growth and development, and in seeking their way forward, each will contribute to their own success, as well as toward the success of the school.

Teachers, students and parents who believe Metro is successful, understand the role they play in contributing to that success, and the importance of community in maintaining that success. The fact that Metro is perceived to be a work in progress only seems to increase the commitment of those who believe it will ultimately succeed, compelling them to take part in moving Metro forward to improve, expand and deliver the Program as it was envisioned, and striving to achieve what each individual student and teacher needs it to be to meet expectations for academic excellence.

4.8 Factors that Affect the Metro Community

In this section of the report, we review issues raised by interviewees (N=32) and student questionnaire respondents (N=108) concerning perceptions about ways in which Metro is not meeting expectations, and discuss how these issues may impact the well-being of the Metro community. These issues concern features of everyday interaction that present challenges and frustrations across the Metro community. In the previous Sections (4.1 through 4.7), we learned about what Metro community members think is working at Metro, and focused on key behaviors, motivations and values associated with effective community-building processes.

The flip side of the coin concerns equally critical aspects of the Metro community that include perceptions about lack of communication, lack of commitment or involvement, and ineffective collaboration as dimensions of the community that are not strong and are considered to be areas where more work is needed. These can erode or otherwise stress community relations as Metro grows, and ultimately create obstacles that teachers, students, parents, and staff feel they need to confront. Putting these issues into perspective to consider related factors may also provide insight and explanations about how these issues can help to inform mitigating strategies, as well as to identify appropriate mechanisms to address needs for improving the situation.

While it is not the intent or purpose of this study to evaluate the program's academic performance, the challenges associated with achieving Mastery described by students, their parents, and teachers alike, concern meeting the time constraints of the accelerated program and advancement to early college entrance. The relationship between these issues and perceived social consequences associated with lack of progress on Mastery may also signal emerging stresses on the Metro community as first- and second-year students proceed through the Program to their senior year.

Table 4-5 presents interview respondents view of Metro and shows that 33% of the parents say that Metro is not meeting expectations (N=6), with 25% of students (N=12), and 21% of the teachers (N=14) sharing this view. Among this same group, when students were asked what they liked least about Metro, or what teachers and parents thought were the weakest aspects of Metro, 34% said there was not enough *buy in* by students, teachers and parents, 28% identified lack of time as a problem affecting their involvement and effectiveness, and 22% said that lack of organization, poor communication and constant changes in the schedule make it hard to stay informed. A quarter of the respondents, said they thought that the community is being "fragmented" by formation of student cliques that have emerged more strongly in the second year of Metro.

Among student questionnaire respondents, in response to the question, *What do you like least about Metro?,* 17% of the students said they thought the Program was too hard, required too much work, or thought there was not enough time to complete their work. Mastery or the grading system was named by 16% of all 108 students, including 26% of 10^{th} grade males (N=31) and 16% of 9^{th} grade males (N=31). Among 9^{th} and 10^{th} graders, (13%) said that "last-minute" changes and "disorganization" makes it hard to stay informed about what is happening at school and also thought that not knowing caused "missed opportunities" for involvement in field trips or other out of classroom activities.

In summary, these responses suggest that there is some consensus on several key issues that teachers, students and parents perceive to be impediments toward maximizing the opportunities that Metro offers, or in certain ways affects their performance at Metro. The relationship between constraints on time and effective involvement in the Program for both teachers and students bears further exploration, as does the issue of communication and related issues of frequent changes in the daily schedule, which study participants also said affects participation.

4.8.1 Communication

Across all groups interviewed and among student questionnaire respondents, there is consensus that communication issues affect their level of involvement and also contribute to a feeling of "disorganization" for teachers, students, and parents. A breakdown of the interviewee responses shows that half the parents said that improving communication was essential to their involvement in Metro. Fourteen percent teachers, and 17% of the students agreed with parents that communication needs to be improved.

Statements about the differences between the first year and the second year at Metro, suggest that all groups believe it is harder to stay informed about trips and other opportunities in the second year of Metro. One parent stated that "Metro is new and we do have some growing pains. Communication is something that needs improvement. As Metro is growing and becoming more mature…getting information out to the parents has not always been smooth" (5007). Improved communication and problems with staying in the loop via email are also cited by another parent as important factors affecting their ability to participate (5006).

Some parents also think that communication with teachers has dropped off in the second year of Metro (5005), and there is agreement among some of the teachers that this year has been more challenging for them to make time for regular communication with parents (3003). Some teachers find it easier to communicate with parents via the internet or phone, and as one parent said, "it is the parent's role to communicate with teachers, and pretty easy to do" (5005). For some, the focus on Advisory and good "teacher-to-teacher communication, and teacher-to-parent communication, is working" (3012).

But lack of electronic access may be a factor of the perception that communication is not working for parents. One parent stated that there needs to be "…better mechanisms of communicating with parents. I think some of the parents would make their kids take advantage of these summer programs, but they're not abreast of what's going on" (5003). Lack of communication also suggests that there may be issues that are affecting parents' ability to participate. The same parent commented that parents of 10th graders who are involved in the PTSO perceive differences between Metro's first and second year, and have expressed concern that parent participation is decreasing noting that "…our Town Hall Meetings used to fill up a whole room and you're starting to see that kind of fall off somewhat" (5003).

Lack of good communication regarding scheduling changes and what is often the hectic and dynamic pace of the Program is also viewed as contributing to "missed opportunities" to participate in field trips and other events by both students and parents. It is apparent from comments about the scheduling issues, that lack of communication is linked with the perception of poor planning, or "last minute" changes in the schedule. As one student put it, "…we're very unorganized. We have a lot of scheduling issues. We often don't find out about neat events until the day before…I feel I miss some of the opportunities because of the lack of priority saying this is going on..." (4055). Half of the parents interviewed agreed that it is too difficult to get involved with last minute events, and would like to see better organization so information reaches them in a timely way.

Lack of communication combined with lack of time are two primary factors cited by students and teachers who commented on the issues affecting their ability to be involved with Metro in meaningful ways.

Problems associated with lack of time may, on the surface, appear to reflect lack of commitment or lack of interest in participating more fully in Metro activities. Feeling that there is a lack of time may actually be the result of challenges in managing among competing tasks and pressure to focus on Mastery. A commonly expressed view emerged from students and teachers who described the situation as "being pulled in too many directions," where competing choices for participation in out-of-classroom opportunities seems as important as focus on class work.

Lack of time was also cited by teachers as a constraint on their engagement in collaborative work with other teachers, some of whom expressed a desire for more structured time for curriculum development. Currently, teachers are expected to develop projects and other required classroom lesson planning in the morning hour before school begins, and after school. With the growth of after-school clubs, teachers are pressed to find time to focus on their own work, or to find time to work at establishing social relations with other teachers. As one teacher noted, at the end of a long day, it's hard to feel friendly. This issue is discussed further in the next section on commitment and involvement.

4.8.2 Commitment and Involvement

The ability to maximize the full array of opportunities provided by the Metro Program can be challenging for teachers and students alike. While the concept that there are no limits on what an individual can achieve in the ideal, the reality is very different when considering the pace of the Metro Program that is geared toward early college entry. For many students, and probably for some of the teachers, the shift to Mastery and accelerated timeframe for early college entry requires skills that, for some, are acquired more easily than for others. One student commented that at Metro, "you are fed the idea that everyone can succeed, but the school is not a right fit for some" (4052).

For students who find the pace overwhelming or who express concerns about pressure to progress under a compressed schedule for Mastery learning, these issues reflect real challenges that may affect meaningful involvement and full participation in school activities both in the classroom and outside the classroom. The pressure to cover four years of instruction in two years is evident in the comments made by teachers and students who are in the process of transitioning from the traditional four-year high school program framework, and are caught short by the reality of the pace and the effort required at Metro. The students who are struggling with the Metro program are described by one teacher as not understanding what is involved to progress in Mastery, explaining that,

> *There are still some students and parents that are not buying in to the concept [that] Metro is about working hard [and] doing your best to pass your classes so you can go to OSU. Some students don't fulfill expectations, they feel that can have unlimited time for Mastery. I don't want those students left behind when their classmates go to OSU. Parents have to work at home on this, we need to communicate more with students and parents about the concept* (3013).

Perceptions that these challenges will increase as the school grows are shared by teachers and parents who are contemplating what they believe to be the inevitable situation where students who do not advance to early college entrance and internship placements in their third year will be left behind. Parents expressed the concern that this will not only directly affect the students who may be left behind struggling to meet Mastery requirements in their third year, but will also affect incoming freshman who will be confronted by the presence of students who have failed to meet Mastery in the time allowed, and who are now held back from college courses while catching up to complete Mastery requirements. As one parent said, "…we need a strategic plan and support for those who aren't going to OSU because they haven't mastered everything. Do you have a plan to deal with their emotional setbacks?" (5003).

Many teachers expressed the view that the goals of Metro are focused on helping every student to succeed in the Program, and as one teacher described it, "The great majority of the Metro community [are] kids who do well, or want to do well. Kids who are very sweet, very, very nice kids. I think there is a place where learning and growing are accepted and honored within the community" (3006). But, clearly not everyone can make the most of the Metro Program, and are instead operating with a different experience of Metro reflecting expectations for achievement not fully met. One student commented that Metro promotes an idea of "…utopia. Perfect school, perfect students. The reality is not everyone is perfect. It seems so wrong. They don't have lockers. You can't keep your stuff safe. People are stealing iPods. More kids are focused on learning, but [they] still have trouble makers" (4086). Teachers who are confronted by these views recognize the importance of meeting needs of students who require more support and guidance to meet the Metro Program requirements. Yet, teachers are the first to say that time constraints to work with every student are significant.

For one teacher, the pace at Metro is demanding and leaves little opportunity for anything beyond focus on classroom instruction, noting that,

> *...at Metro school, you don't have down time. You're busy all the time. You should deal with different students, not just those in your class, but [also] the ones in your Advisory. You don't just deal with colleagues, but [also] with guests who want to do activities with you* (3012).

Additionally, when considering the changes that will occur as the school grows, it should not be overlooked how teaching loads will expand for teachers who must now conduct instruction on different levels depending upon the needs of the students in a given class. In effect, the three courses they teach each trimester can actually represent teaching at 3, 4 or 5 different Mastery levels in a single class depending upon progress to Mastery for individual students. This may also compound as students who do not keep pace with Mastery require more instruction to meet Mastery standards.

Goals to improve collaboration among teachers are often cited by teachers who express concern that a lack of time to develop professional partnerships is linked with the lack of opportunity to establish social relationships among teachers. Lack of time is commonly cited as a major impediment for building rapport among the faculty essential to developing good working relationships. In this view, collaboration requires social rapport as a prelude to effective teamwork, and therefore, for these teachers, collaboration is not likely to improve. While some teachers noted the required collaboration in the second year of the program as having increased the level of collaboration among teachers, comments about the essential nature of the social basis of collaboration remained a cultural theme across Year 1 and Year 2 teachers.

The fast pace of the Metro Program also benefits from the dynamic nature of Learning Partner involvement and the development of opportunities that can occur both in a long-term and a short-term context. The constant changes that result from the dynamic and fluid nature of the Program, and plans that are open to new endeavors and new partnerships, are exciting for some, but for others create a level of stress associated with the unpredictable changes and feelings of "missed opportunities."

4.8.3 Diversity and Student Self-Segregation

As Metro completes its second year, teachers, students and parents express perceptions of differences between Year 1 and Year 2, saying that the school is changing as it expands. One aspect of change develops from the observation that in the second year of Metro, the development of student "cliques" is growing. The assumption that the formation of cliques will detract from the Metro community bears further exploration and consideration of a trend that may continue as Metro adds new age group cohorts to the student population. The idea that students will form friendships and form social bonds based on age

group should not be surprising, and for most teachers, it is normal to see freshmen and sophomores forming friendships with same year classmates.

The more recent trend in self-segregation along age group differences however, is only one dimension of what some parents and teachers perceive to be based upon racial, socioeconomic, or academic self-segregation. Forty-three percent of the teachers interviewed commented on increased self-segregation, with 14% noting that there is more self-segregation based on academic differences in Metro's second year. Parents are also aware of self-segregation that reflects geographic diversity, including an apparent urban/suburban dimension to the formation of cliques. As one teacher commented, "it's challenging to get students and parents together outside of school, because of the geographic distance across Columbus" (3015). This does not seem to be tied to the home school as many students reported that they did not have regular involvement at their home school, but is likely a feature of socializing close to home, where students can get together to head to the mall or to a movie closer to their neighborhood. Others say that emerging urban/suburban issues are not yet clearly defined, or at least not yet characterized well enough for teachers, students or parents to describe the nature of these differences. However, their responses indicate that there is a growing interest in understanding these issues and ways in which to address the changes that may be developing as Metro enters its third year.

The importance and value of developing friendships and social ties among teachers and students has been fully explored in this report. Our findings also suggest that Metro students and teachers identify their desire to link with the Learning Partners, who they say can play an integral role in providing experiences that lead to academic and professional growth. There is a belief that field trips and other extracurricular experiences provide key mechanisms for enhancing and strengthening social bonds between students and teachers, and that these experiences also provide the essential ingredients for developing a sense of a unified Metro identity.

The tendency to self-segregate along differences suggests for some that the formation of cliques among age-groups, or for other reasons, may lead to fragmentation of the community that some have identified as troubling. Others are more focused on the importance and value of diversity among the students, and say that there is a benefit to be gained from exposing students to differences in cultural backgrounds, as well as academic strengths and interests. For these individuals, the value of diversity for Metro suggests that the process will be one that is enriched by the potential contribution of each student and each teacher to the Metro experience. While there is uncertainty expressed by many of the study participants about the reasons for self-segregation and the formation of cliques, these perceptions may only reflect initial reaction to changes in the social dynamics of the student body as the school expands. It will be important to track these changes, and to observe how these perceptions are acted upon as the Metro School community enters its third and fourth years, when the student population will be increased by 100 freshmen students in each of the next two years.

In the next section, we turn to the network study and consider the extended Metro community that includes the Learning Partners and others who have a role to play in the development of the Metro STEM School.

5.0 PUBLIC NETWORK RESEARCH AND ANALYSIS

Metro was founded by and currently operates within an extensive network of governmental and non-governmental partners. This section offers a description of that network as derived from guided discussions and responses to a questionnaire. Key organizational linkages are discussed and the person-to-person links within the Metro network are displayed pictorially. The findings suggest that the Metro network includes many participants, but a few are highly central and play important information-exchange and planning roles.

Before the discussion and display of the network linkages, the qualitative data are analyzed through a theoretical model of network management proposed by Agranoff and McGuire (2001). Viewed both historically and in the present day, the model proves to be a useful and accurate device for isolating distinct management behaviors in the Metro network. As will be shown below, the preponderance of evidence supports the model and also suggests that network management behaviors or "phases" are practiced recursively rather than linearly (McGuire 2002). That is, each of the behaviors that comprise the model are "in play" at any given time. This first empirical attempt at applying the theoretical model to a network thus confirms its utility.

5.1 Network Management Model

Managing networks is challenging because of the changing allocation of resources in the network structure over time. As in many other networks, managing the Metro network is less a function of one person's ability to *command and control* and more a function of a series of persons who, over time, have sustained Metro's networked features. However, identifying actual behaviors is difficult in such a complex structure. In order to facilitate a description of managing Metro's network, a conceptual model from Agranoff and McGuire (2001; McGuire, 2002) that isolates four distinct sets of behaviors or phases of network management is applied to the Metro network. Examples from the research will demonstrate how Metro's network has been managed as shown through the lens of the model. The model components are described below.

Activation

The first category of behaviors undertaken by network managers in the Metro Network was and continues to be *Activation*, which may be the most important activity of managing networks. In general, activation refers to the set of behaviors employed for identifying and incorporating the persons and resources (e.g., funding, expertise, legal authority) needed to achieve program goals. Selective activation is based on correctly identifying necessary participants and other resources needed for the network. The skills, knowledge, and resources of these potential participants must be assessed and tapped. Activation is a critical component of network management because resources like money, information, and expertise can be integrating mechanisms of networks. As will be shown, activation describes both the initial efforts to create Metro and the current efforts to expand the number of Learning Partners and other learning opportunities for third- and fourth-year students at Metro.

Framing

The second network management behavior employed in the Metro network helped frame the structure and the norms and values of the network as a whole. *Framing* is defined as the behaviors used to arrange and integrate a network structure by facilitating agreement on participants' roles, operating rules, and network values. Managers cannot draw up an organizational chart in a network as is done in single organization structures, but they do try to influence the roles that each participant may play at any given time and the perceptions one has about the common purpose of the network. Managers do this by facilitating agreement on leadership roles; helping to establish an identity and culture for the network; assisting in developing a working structure for the network (e.g., committees, network "assignments"); and altering the perceptions of participants to understand the unique characteristics of working with persons in contexts without organizational mechanisms based in authority relations. Like activation,

framing was used during the formation of the Metro network and is used currently as a tool to improve network effectiveness.

Mobilizing

In addition to activating and framing the network, managers must induce individuals to make and keep a commitment to the network. *Mobilizing* behaviors are used to develop support for network processes from network participants and external stakeholders. Mobilization in this regard has been a common and ongoing task for achieving Metro's network effectiveness. Managers of Metro have built support by mobilizing organizations and coalitions, forging an agreement on the role and scope of network operations, and establishing legitimacy as a viable high school.

Synthesizing

Finally, the model posits that managers employ *Synthesizing* behaviors intended to create an environment and to enhance the conditions for favorable, productive interactions among network participants. One critical behavior of network management is to build relationships and interactions that result in achieving the network purpose. The strategies of each network participant and the outcomes of those strategies are influenced by the patterns of relations and interactions that have developed in the network. Synthesizing behaviors include facilitating and furthering interaction among participants, reducing complexity and uncertainty by promoting information exchange, and facilitating linkages among participants. Successful network management thus achieves collaboration between network participants while minimizing and removing informational blockages to cooperation. The research presented here shows that although the Metro network is certainly sustained by communication and the exchange of information, *synthesizing* the network takes place among just a few persons.

5.1.1 Application of the Network Management Model to Metro

As will be demonstrated, the Metro network is an ideal type network for demonstrating the importance of management and leadership. The "sequence" of activating, framing, mobilizing, and synthesizing is actually practiced recursively rather than linearly, occurring at the beginning of Metro but recurring throughout its operation. The network continues to expand, it is driven by deeply held values and operating norms, support by key executives is enhanced, and relations within and across the network are, for the most part, open and cooperative.

Initial Efforts at Activation and Framing

Activating the Metro network through the selection of key partners and the acquisition of critical financial resources dominated the early days of the development of the Metro network. Nearly simultaneously, the school's principles, norms, and operating structure were *framed*. How Metro moved from a concept into a reality and how the Metro network was formed relates directly to these behaviors**.**

Some key partnerships undertook the early activation of human and financial resources. As early as 2004, executives from Battelle, an international science and technology organization that undertakes research and supports education, and The Ohio State University (OSU) "talked at a regular breakfast meeting and [they] discussed a special math and science school" (1026). Battelle was interested in advancing math and science education, perhaps creating a specialized high school, while OSU wanted to enhance the ability of its future students in the technical fields of the sciences and engineering. Their similar goals spurred dialogue. The CEO of Battelle and the President of OSU began to engage in conversations about the high school effort and through extensive discussion, these representatives of the partnership that grew into the Metro network agreed on an initial framework for the school. They ultimately agreed to put their organizations behind the school with the following policy criteria:

1. The school would involve public-private partnerships and other collaborative working relationships.
2. The project was to be scalable. More than one ought to come out of this effort.
3. It needed to be sustained without philanthropy.

4. The school needed to be public and one that was general access—not an elite or private school—but with high standards.

The CEO of Battelle worked on some major concerns and enlisted other persons (who would later be part of the core Metro advisory body, the Metro Partnership Group, or MPG) to generate a proposal for a math and science school. Thus, the initial Metro network emerged from an idea for a small high school almost two years before the school opened.

Individuals at KnowledgeWorks Foundation (KW), a school innovation foundation based in Ohio, were already involved in a Gates Foundation grant to restructure Ohio high schools into 58 smaller units as part of the Ohio High School Transformation Initiative. The people at KnowledgeWorks were affiliated with the national Coalition of Essential Schools (CES) as far back as 1989. The first significant step was to obtain a $200,000 grant from the Gates Foundation and CES to plan a small school in or around Columbus.

Participants in this small, existing network began to look for free or inexpensive space, a critical factor in beginning such an effort. Columbus City Schools was approached as a *first sponsor* district, but the district declined. Also, COSI (Center of Science and Industry), an independent non-profit museum that supports science education, was approached. COSI expressed interest, but the cost of renovating space was prohibitive. In addition, The Ohio State University (OSU) showed interest in operating a "downtown demonstration school," but the idea initially had no traction (1014). Meanwhile, the small network slowly expanded, bringing in two retired teachers, a science expert, a student, and somewhat later, the Executive Director of the Educational Council (EC, also locally known as the Ed Council), the latter of which is a "non-profit organization formed in 1986 to foster cross-district programming and improve education through a confederation of 16 public school districts in Franklin County" (Educational Council, 2008).

The Ed Council, representing the superintendents of these 16 school districts, insured the fourth project criterion was met. The Ed Council, which was engaged in cooperative programs, offered needed space and gap costs. It was already sponsoring many community-wide programs that involved learning partnerships and centers in the area, such as the Christopher Program (personalized learning), Safe School Audit, Safe and Drug Free Schools Consortium, After School Counts, and others. Through the vehicle of a memorandum of understanding among the partners, the Ed Council became the *official body* of Metro policy, although their decisions were, and remain, subject to a host of partner discussions and prior agreements.

Framing in Tacoma

As the network was forming it became time to move forward with plans. A group of executives from the partners—Battelle, OSU, KnowledgeWorks, Ed Council, and COSI—went to Tacoma, Washington to attend a conference of the Coalition of Essential Schools. The group spent the majority of the five days intensively planning in a rented hotel conference room (one other executive from Battelle joined the group by phone). Since the group included executives, including two OSU deans, all could speak for their respective organizations. The group "nailed down key commitments: OSU for space, Battelle for dollars. We identified one of the two KW people as principal, a key decision" (1015). Although the OSU deans had to be convinced that they should get involved in becoming partners in a high school, the basic parameters of operating the school were developed at the meeting: size, focus, learning modes, early college credit, and *replicability*. The group divided up roles and responsibilities, and in the process, built a series of agreements that were ultimately important in developing the partnership structure and building trust. Over a period of time, the Tacoma group officially evolved into Metro's major pre-policy advisory body, the Metro Partnership Group (MPG).

Activating Resource-Bearing Partners

Metro was launched by the shared financial/finance-in-kind commitments of key partners and their willingness to work together and lend their knowledge, also a vital resource. Both financial resources and knowledge are essential to make a networked entity operate. The commitments were necessary because the participating agencies and organizations had to come together to do what they could not do alone, and because each individual (or network node) possessed resource/knowledge/policy/program gaps, making it impossible for any one partner to go it alone. For example, neither Battelle nor OSU, as the closure of lab schools nationwide proves, is designed to run high schools. However, the members of the Ed Council did possess this expertise. On the other hand, Battelle and OSU had other resources (money, space, and expertise) that were valuable to the effort and not possessed by the Ed Council. Together the three partners brought key resources to the successful development of Metro.

Of course, the partners have other, school-related long-term interests, including the development of individuals adept at math and science, who might pursue related careers. This means that the partners' effort in Metro amounts to a power/dependence relationship. Their mutual dependence led to and continues to lead to exchange and consequently various forms of negotiated behavior within a network.

Each partner pledged financial commitments, as well as in-kind expertise, goods, and services. Battelle's initial up-front contribution of $600,000 per year for the first few years was the most tangible of the Metro Partnership Group's commitments. Beyond the financial commitment, Battelle lent critical personnel to the effort, including its public relations firm, a project coordinator stationed at the school, and hundreds of hours of staff time to work with students on projects as mentors, tutors and Learning Partners.

OSU provided the space for the school, a three-year, $1.2 million lease, and loaned its architectural staff to design the labs and draw up building remodeling plans. Three of the university's colleges supply nine graduate teaching assistants (GTA) assigned to Metro faculty, as well as tutors and counselors. Each graduate assistantship is valued at $29,000. A number of these commitments come out of existing college budgets, while others are subsidized through grants or directly contracted by Metro, such as the counselor program. The success of the Graduate Teaching Assistant program prompted the College of Education and Human Ecology to partner with the PAST Foundation to create the Design Program Center. This program is housed within the same building as Metro to foster the graduate assistantship program as well as program development for the high school. This investment represents over $45,000 per year in lease value.

The 16 Franklin County school districts crafted a complex exchange of funds and services. Since Metro is designated a *Program*, not a high school, all Metro students remain tied to their *Home School*. Based on population, each School District is entitled to a specified number of seats in each new class at Metro. Each student upon graduation will receive two diplomas, one from their Home School and one from Metro. Thus, the 16 school districts agreed upon tuition transference from state allotted, tax-based, public school, student support. Each school from the 16 participating districts sent with their Metro enrolled student a per capita payment of $5840 per year. This support represented $578,160 (99 students) in the first year, and $1.19 million (204 students) in the second year. Third year support will increase to $6,300 per student bringing the overall support to approximately $1.89 million (300 students) (1001). This transferred tuition does not cover all costs associated with the students. Each Home School absorbs the administrative costs of transacting credits, academic counseling, as well as the costs associated with Metro students who opt to participate in Home School after-school activities, such as band and sports. Metro absorbs approximately $90,000 for Special Education costs and $90,000 for subsidized school lunches.

Outside the initial primary three partners, KnowledgeWorks made a commitment of $1 million dollars over three years for start-up, technical assistance, and college tuition grants. In addition, they provided teacher mentorship throughout the academic year. KnowledgeWorks' ongoing commitment to Metro

garnered them a seat in the Metro Partnership Group in 2007. Invited to join the network in the early planning phases of Metro, PAST Foundation committed $194,000 in program development services within the first academic year of Metro.

Finally, in this phase of creating a network, activating the resources of extended time and expertise borne by the key leaders representing the major partners is critical to the effectiveness of the Metro network. Activation begins when the executive or leadership design team incorporates persons in key positions within their respective hierarchies. These leaders' primary resource bases are knowledge combined with organization collaborative potential; that is, the clear ability to speak for and commit their organization. This type of partner is key because only he or she has the commitment combined with technical know-how to guide the enterprise. The Tacoma exercise in concept formulation is a prime example. The major *legs of the partnership stool* were there. Also, the design team came back from Tacoma and enlisted elements of the community to the cause, another crucial element of successful networks. Academically, first and foremost was the cooperation of the Columbus City Schools Superintendent, followed by other supportive Ed Council superintendents. The group of partners managed relations with the potential community learning centers, including museums and art centers, along with Battelle and OSU. As the executive group morphed into the Metro Partnership Group, they found new resources to support the school. One notable find was a field-oriented educational group, the PAST Foundation, which became instrumental in developing applied learning programs. In making their linkages, the Metro Partnership Group solidified the partnership concept and demonstrated the need to continually involve new partners.

From this brief overview, it is apparent that collectively, the network possessed resources of all types, but that the network participants rarely had the resource capacity to perform all program activities on their own. This shared-resource capacity led to dispersed and in-kind, off-budget resource commitments that are not at all unusual in a networked entity. Indeed, such commitments are at the core of activating and framing a network.

Activating Other Resources Today

As in the case of most networks, Metro now operates substantially beyond the primary multi-partner exchange or resource budget that was described earlier in the report. That happened because a substantial proportion of the learning experience lies outside of the schoolroom buildings and the work of teachers. Metro students are not only at Battelle and OSU, but are at learning centers (COSI, OSU Library, Mayor's Office, Wexner Center for the Arts, Art Museum, and SWACO [Solid Waste Authority of Central Ohio]). Starting in their second year, some Metro students began taking OSU college-level classes and other classes, such as engineering, outside the school. This facet of the Metro Network is in keeping with most networks, who rarely implement their entire service and operational functions exclusively; they almost always depend on other suppliers.

Thus, Metro can operate in a smaller location and on a smaller scale contracting for some services (e.g., food service, calculus classes, counseling), which is a common form of activating resources that aren't easily available to the primary network. Some of these are *public goods*, that is, part of the public domain, such as libraries, museums, and public agencies. Other services, such as OSU classes, are publically subsidized (tuition is normally less than half of costs). In order to be successful, it is vital to identify and exploit these public goods and services, bringing them into the network orbit. Metro has been particularly good at identifying and exploiting such resources, thereby sustaining themselves and taking advantage of rich resources in the community. It is in many ways a matter of activating and engaging collaborative linkages.

Framing the Guiding Principles

One critical force that makes the Metro network operate is the essential agreement that was reached on the philosophical guiding principles that ultimately led to the school's operation. Although these principles were not automatic, the partners willingly brought their diverse outlooks, experiences, and professional orientations to the table, along with a variety of ideas about how problems might be solved.

Thus the synthesized principles were a product of open discussion, shared exploration, and most important, general agreement. For Metro, the most important starting points were a combination of CES small school principles and STEM education.

The CES ten Common Principles are familiar to the educational community and widely published:

1. A focus on developing habits of the mind;
2. A mastery of a limited number of skills areas and knowledge;
3. Individualized instruction and goals;
4. Teaching and learning that should be personalized to the maximum extent;
5. Enabling students to learn by teaching themselves;
6. Assessment of teaching and learning based on student performance or real tasks;
7. A tone of decency and trust;
8. Commitment by the administration and teachers to the entire school beyond respective areas of mastery;
9. Resources will be modest and devoted to teaching; and
10. Incorporation of non-discriminatory and inclusive policies, programs, and pedagogies.

STEM is based on the idea that business and industry leaders, policy makers, and educators need to converge around advocacy for strong science, technology, engineering, and math education as essential for the future of the country. Global competitiveness demands local intelligence. Cities with the greatest economic development are places that grow, attract, and keep the best minds, and where high value is placed on innovation, talent, diversity, creativity, and education. STEM education is based not solely on pedagogy, but on new strategic approaches and different forms of public and private partnerships at the local level with support from state and national resources (1001, presentation to the Educational Council).

As one of the Metro founders explained, the basic Metro concept "was based on a triangle of issues." At the apex was "start small, stay small" (1015). One leg involved "autonomy" from a school district or some other form of organization or jurisdiction. The other leg involved the CES principles. Inside the triangle was the project goal: "To create a small, highly personalized, intellectually vibrant school." These became the grounding issues. Later, when Battelle and OSU were added to the mix, the STEM approach was blended into the three broad issues. These were carried to Tacoma and heavily influenced subsequent Metro Partnership Group and Ed Council deliberations.

In a networked entity like Metro, taking the time to become exposed to, deliberate over, and reach general agreement is critical in order to move forward. Partners come together from different organizations and agencies, with different specialties, intellectual and cultural outlooks, and practices. A set of agreed-upon, basic, operating principles—a network philosophy—allows the interacting leaders to read from the same book and even on the same page, so to speak. Such an agreement on principles makes it easier to focus on subsequent details. At Metro, such factors as the number of students, selection criteria, space, curriculum, and financing allowed the design team to be guided by principles of operation.

Mobilizing Support for Metro by "Going Public"

Activating various resources and framing the organizing principles of Metro are just two components of managing the Metro network. After these phases, the network must take action for successful network development. For example, after extensive planning, the group from Tacoma became convinced that too much planning over a long period of time would perhaps crumble the partnership efforts and commitments, and close the window of opportunity. That is, too much *Framing* at the expense of *Mobilizing* support could result in a kind of "collaborative inertia" (Huxham, 2003). After consultation with the Mayor of Columbus and representatives from the Governor's Office, a decision was made to go public. One discussant shared that, "It was important to make a public declaration to do it, to involve a diverse set of civic leaders" (1002). It was a "stake in the ground" promise (1002). So in late 2005, a

public announcement was made that the school would open in August 2006 with the first class of 100 students drawn from the 16 Franklin County school districts.

With the assistance of a public relations firm that worked with Battelle, a series of materials on the Science, Technology, Engineering, and Mathematics (STEM) concept were made available, along with a series of news stories that were carried by press release. Also, a number of groups and agencies such as the Ohio Business Roundtable and the Ohio Department of Education joined The Coalition of Essential Schools and KnowledgeWorks as active supporters.

The Battelle CEO, the OSU President, the Columbus Superintendent of Schools, the Ed Council CEO, the Columbus Mayor, a State senator, and one other school superintendent attended the public announcement. It was a public statement of intent, with a time line to get student "butts in the seats" by August 2006 (1014).

Mobilizing through Network Champions and Partners

In order to maintain commitment to the network's viability and mobilize external support for the network's activities, most network operations require one or more persons who are catalytic leaders, who have a passion for the collaborative undertaking, and thus, can make things happen. Despite the fact that authority is dispersed and shared in networks, someone still needs to emerge and help orchestrate a vision, see that a plan is being followed, orchestrate contacts among key partners, and command a reasonable measure of resources. These are the champions of the partnership-related undertaking.

Metro was fortunate to have two primary champions. The most visible champions were clearly the Battelle CEO and the OSU President. In addition, the support of former U.S. Senator John Glenn and the OSU Provost were very important. Together, the Battelle and OSU leaders provided oversight and monitoring of the process. These key champions did not become involved in the details, but instead provided a rallying point for mobilizing support and giving legitimacy to the endeavor.

The role of the champions was two-fold. First, the champions had to sell the basic idea of a STEM school with CES principles to their respective organizations. The champions had to convince internal parties that it was a worthwhile investment of organizational resources. For OSU, this meant convincing external relations (e.g., the Board of Trustees) and internal relations (e.g., the colleges), and in particular the three colleges that ultimately became investors. It was said to mean a lot of "mountain moving" in the large, slow, OSU bureaucracy (1002). For Battelle, it was working with administrative staff to support the effort and to convince them that investing in STEM education was a wise new "business start" (1002).

The second role of the network champions was working with leaders in the community by selling the idea before civic groups, trade associations, city and county elected officials, legislators and state agency personnel, and to the business community. One person referred to the champions as "ice cutters who helped move the obstacles out of the way" (1002). Their role was mainly in connecting and trying to get people to move forward. The two prime champions kept in regular touch with one another. Their roles were in no way functional, but to support all of the parties involved in more direct issues and to reinforce the resource commitments, drawing on their established networks.

Mobilizing by Establishing Public Legitimacy

The network planted its roots within the Columbus community. The support-building processes were critical to establishing acceptance. In all networks, legitimacy-building efforts are important because there is no built-in or automatic, legally-based legitimacy. By contrast, a charter school receives a legal charge from a state or school district; it is a legal entity and thus possesses a similar legitimacy as that of most public schools. Similarly, a private school has a license and a board of directors, and if it is non-profit, it is a legal 501c(3) organization. A for-profit organization has state-chartered corporation status. Metro is none of the above, and thus has no such automatic legitimacy. It had to build legitimacy by going public and announcing the Battelle, OSU, Ed Council partnership. The tripartite Memorandum of

Understanding (MOU), in addition to the fact that the Ed Council sponsorship represents a voting body, added some public legitimacy. However, the partners constantly work at keeping the public informed and mobilizing support to earn legitimacy.

Synthesizing Network Operations by Planning

After the time in Tacoma, there were scarcely 6 months to put a lot of details in place. The skeleton staff of the principal and a first-hired lead teacher began to flesh out the curriculum and build the school. OSU began involving faculty to assist in the curriculum build-out. OSU promoted inclusive town hall meetings open to all comers. They were initially presented with the parameters of "small school with a big footprint" design, to engage "60-80"students per class year with university and Battelle involvement (1014).

Planning was based on the *Backward Mapping* strategy, where planners begin with the end goal or result and work backwards to the starting point. In essence, time horizons are reversed. A backward mapping strategy enables the participants to focus on the results of the network rather than simply the process. The Metro planners started with the end goal of a Metro graduation five years in the future. The lead teacher and designated content-area leaders worked with a series of curricular planning teams from Battelle, OSU, PAST Foundation, and area high schools. Each team was comprised of 8 to 16 persons, all of whom were volunteers. The subject areas included life sciences, physical sciences, fine arts, global languages, math, social studies, and language arts. These "open to anyone" task forces met weekly for three months and the results of the meetings went first to the Metro Partnership Group and then on to the Ed Council to insure the curriculum was aligned with the Ohio Educational Standards within each content area (1014).

At the same time that the curricular design was being forged, the Tacoma group of leaders met regularly to work out the location, physical plant, OSU contributions, philosophy, how to differentiate the four grades, overall size, and so on. The Ed Council became involved in the details of how students were to be chosen, as well as school financing. OSU and Battelle took the lead on building issues. An OSU architect was loaned to design classrooms/laboratories.

Concern was initially expressed that math and science educators would tell the curricular teams what to do from the OSU standpoint, so the College of Education and Human Ecology was not put into any kind of lead or special role in this process; they did not participate in the working sessions because of its reluctance to be involved. One respondent noted that, "we couldn't wait for that college to come around because we were facing opening" of the school (1014). Despite few incentives to volunteer, a total of 9 of 18 OSU colleges were represented, including the physical sciences. One unfortunate part of the process, related one discussant, was that the College of Engineering was not engaged (1011).

5.1.2 Managing Metro through the Four Phases

The preceding analysis of the qualitative data was conducted through the lens of the Agranoff and McGuire (2001) model of network management. The four *phases* or behaviors of managing networks—Activation, Framing, Mobilization, and Synthesizing—were evident both from a historical perspective and by examining the ongoing activities of the network.

Clearly, *activation* was at the heart of the development of Metro's network. The idea for a new school emerged from a single grant program and progressed through a process of adding individuals to the mix who possessed the resources necessary to create the school. Although built initially around the financial resources included in the grant, the key resources that were activated were human, as embodied by the expertise of those few persons involved in the initial feasibility study. The network expanded quickly into the *Tacoma group* as it continued to incorporate additional persons into the mix. Prior working relationships grew, new social and professional connections were established, financial commitments emerged, and, overall, the size and scope of the network evolved into a fully-activated entity.

There were some difficulties in adding key partners, but once the original designers of the school identified and incorporated the primary partners, the project moved rapidly forward. "Recruiting" was a term used often by the discussants, suggesting that some persuasion was necessary to get key individuals into the network, but also showing the importance of getting the right resources in place early. This was without question the most important task of the early network managers. Success was dependent on proper activation.

Framing the network was performed almost from the beginning. In terms of establishing the norms and values of the network, which is a key framing activity, the CES Common Principles were the guiding norms for establishing Metro and were viewed as being "unequivocal," said one discussant (1001). In addition, experiential learning was valued by the leaders, as evidenced by the early inclusion of COSI into the deliberations and the early development of learning centers. Decision-making processes and organizing principles were developed early as well. As one participant in the Tacoma group stated, it was in Tacoma where "we developed the parameters, divided up roles and responsibilities, and built process agreements that allowed us to come out with a sense of trust" (1001).

One vehicle for establishing managerial roles in the network was the MOU developed by the Ed Council that included OSU and many other learning partners. Later, the Metro Partnership Group was formed as the operational network "manager" to deal with issues of school operation, giving general advice, providing insights, brainstorming, and discussing potential grants. In order to create a unique culture and identity for the network, which is another important mechanism for framing the network, the school publicized its creation, opening, and continued operation.

One of the most successful, but difficult, managerial activities of Metro has been the early participants' awareness of the importance of *mobilizing* external support. Indeed, many discussants noted how involving the executives of Battelle and OSU during the summer of 2005 changed everything. Many discussants mentioned the importance of engaging deans of several colleges and schools at OSU, and also the obstacles presented by not having the College of Education and Human Ecology involved early in the process. In addition to the support of key individuals, critical stakeholders of Metro are obviously the parents of Metro students and the taxpayers in Franklin County. Thus the founders held inclusive *town hall meetings* as a means to solicit information and to create the buy-in necessary for such an endeavor.

Information dissemination throughout the Metro network has been paramount to the network's success. Such activity is the heart of *synthesizing* a network. Task forces were created to encourage negotiation and deliberation. Curriculum for Metro was drawn up in groups. It is obvious from the degree of knowledge about the network displayed by the discussants that many people were in and remain in the loop. Language used in the network is "non-contrived," as noted by one discussant (1008). And, as will be shown in the next section, the network relationships described by all 53 of the questionnaire respondents is based largely in receiving and providing information. Unlike many networks that suffer from a "collaborative inertia" that is characterized by information blockages (Huxham, 2003), the Metro network remains transparent. Also, the central participants in the network obviously value cooperation with the other network participants. Activation is critical, as asserted earlier, but Metro is highly successful at facilitating productive linkages among the broad array of network participants. Rather than becoming insular over time, the discussants conveyed that the Metro network managers continue to seek advice, invite guidance, and plan within the steering groups.

Although evidence of activation, framing, and mobilization is prevalent in the Metro network, there is less evidence of synthesizing in the data collected through the discussions. As noted, synthesizing is based in creating an atmosphere where productive interaction takes place and, in part, is dependent on the free flow of information and deliberation. Planning is one mechanism through which a synthesis of network operations emerges. In order to fully examine synthesizing behaviors, it is necessary to look at the extent to which the Metro network is built on information exchange and joint planning efforts. Toward that end, the numerous linkages that constitute the Metro network are discussed below. We then

turn to an examination of the dynamics of the many Metro networks within the network, including the information and planning networks.

5.2 The Metro Network's Organization-to-Organization Linkages

Any collaborative undertaking is likely to engage in literally hundreds of connections in order to establish a structure and to operate. Several major types of inter-organizational linkages appear to be at the core of Metro.

5.2.1 Other School Models

The Metro founders were already in the *small school loop* through KnowledgeWorks. Two of the early participants were coaching or consulting in this arena of high school transformation. They were in attendance at national CES meetings, and could easily call upon a wide range of people. Additionally, there was greater interest in looking at small STEM schools, resulting in visits to several locations, including:

1. Aviation High School in Tacoma, Washington.
2. High Tech High, an information technology-oriented school in San Diego, California.
3. Boston Scientific in Boston, Massachusetts.
4. McKinley Technical High School in Washington, D.C., an engineering-focused school.
5. Denver School of Science and Technology in Denver, Colorado.

With the exception of the STEM focus, some of the visited schools were not congruent with the emerging Metro guiding principles. For example, Boston Scientific is quite traditional in delivery, with one-hour classes, gifted admissions, and field experience. Most were public schools that are part of a larger school system, so the governance paradigm was not in alignment with Metro's.

The visits did, however, provide important exposure to STEM, "with an eye to taking teaching out to the edge of learning experiences," relayed one founder (1001). "In that sense we were looking for best practices." This included how to integrate STEM into the curriculum. In addition to curricular design, the visiting group explored admissions policies, governance models, and professional development. Funding models were less of a concern because Ohio's situation places a lot of determination on local districts. The challenge in this regard was to think through an alternative to the charter model, to get multiple districts to finance the school. Out-of-state models were not as useful, but one model was located right in Columbus: the Christopher Program sponsored by the Ed Council. Thus, it was STEM education, in more or less autonomous schools, as the pre-opening linkage goal, choosing the more creative and inventive models, and then expanding them.

5.2.2 Ohio Linkages

The Ohio Department of Education (ODE) was and continues to this day to be the foremost contact in state government. These interactions are over many issues, including school regulations, standards, curriculum development, and graduation requirements. ODE specialists review many of Metro's curriculum ideas, such as field-based learning, the development of math mastery benchmarks, and the integration of language arts and science project experiences. At the core of the interaction with ODE is the large volume of "on the ground" instruction that ultimately needs to be aligned to the Ohio Education Standards, so that Metro students can go on to OSU.

A second state level contact is KnowledgeWorks of Ohio, which continues its involvement with Metro. One of the Metro founders from KnowledgeWorks is available as a Metro coach for one to two days a week. This person is also involved in an 18-month venture to document the planning stages for future reference for other potential partners. It has led to a KnowledgeWorks spin-off, ED Works, a fee-for-service consultancy.

Additional contacts in Ohio include state-level political leaders. The Ohio General Assembly debated and passed a STEM law, House Bill No. 695, which promotes STEM education and provided an initial $13 million for new STEM schools. Key politicians, including the governor as well as the Senate and House leadership, supported the HB695.

The Ohio Business Roundtable and its affiliate The Business Alliance for Higher Education and the Economy are notable network participants. They have promoted STEM education and the start of Metro. The organizations' lobbyists were behind the STEM HB695 and the $13 million appropriation. The Roundtable has helped the Metro Partnership Group approach the Gates Foundation nationally for support and has also financed and produced a multi-color publicity booklet on STEM high schools around the country featuring Metro. Concern for education is very much on their agenda.

Several other Ohio-based organizations have had involvement with Metro through connecting missions:

1. Battelle for Kids (a counseling program that offers value-added analysis and provides educators with consulting, professional development, and tools to improve teaching and learning)
2. Ohio Education Association (teachers' union).
3. Ohio Resource Center, co-located with Metro (online access to best practices in science and math learning), used to extend Metro learning approaches to other schools.
4. Buckeye Association of School Administrators.
5. Ohio Governor's Office, which has a grant program to coordinate STEM policy in the state, and the National Governors' Association has a STEM Center.
6. Ohio Math and Science Coalition (teachers).
7. State University Education Deans Association (SUED).
8. Ohio Education Deans Association.
9. State of Ohio Board of Regents.
10. Kids Ohio (a consortium of charter schools).

These connections exist to reinforce public support and to articulate and exchange extant resources. Metro scans the environment to see what is out there in the world of math, science, and engineering. Its leaders seek grants and develop mechanisms to help others see how Metro is part of the science and math establishment.

5.2.3 National Linkages

During the planning months of Metro, the most significant contact was with CES, particularly through its $200,000 planning grant. It was actually money from the Gates Foundation that passed through CES. It should be noted that the CES linkage was strained for a period during start-up. In Metro's public announcement the local partners—Battelle, OSU, and Ed Council—were emphasized whereas CES was not identified. CES let the local group know that it was displeased to not be publically identified as a partner (1014). Apparently, this dispute has been bridged. Currently, the Metro partners are dealing directly with the Gates Foundation.

In October 2007, the Gates Foundation notified the expanded Ohio STEM network working through a Battelle grant of $13 million to start an Ohio STEM Learning Network (OSLN). This grant spurred the passage of Ohio House Bill 119, which was intended to initiate and support statewide STEM reform. The combined funding from the Gates Foundation and the Ohio Legislature is intended to support the *Stand-up* of five STEM hubs around Ohio in Cleveland, Cincinnati, Dayton, Akron and Columbus (1015). Each hub and its connected STEM schools consist of business, industry, and higher education partners. These partners are to introduce the best practices developed at Metro and those exported from Metro to the sponsoring school districts. Eventually, the OSLN is expected to develop into a best practices exchange.

Also through the Gates Foundation, the Metro network has linkages to a nationally recognized classroom learning organization—TIES (Teaching Integrated Education for Science.) TIES provides a conduit for

Metro to nationally recognized, best practices in STEM schools, constantly exposing the MPG and principal to current trends and practices. The TIES director, who has extensive experience establishing STEM schools, is also the senior consultant to the Gates Foundation regarding STEM-based learning, providing another reciprocal link in the Metro network.

Another national organization that has become a major Learning Partner with Metro is the National Association of Black Engineers (NSBE). They inaugurated a chapter at Metro and support many student projects, actively engaging the students in regional and national conferences and competitions. Recently, NSBE established its regional outreach office in the same building as Metro.

The number of national Metro Learning Partners continues to expand and any listing becomes immediately obsolete when committed to paper. Currently, a number of other national organizations with which Metro has been in some form of contact include:

1. National Science Foundation and the National Science Board, through the OSU's Battelle Center for Science and Math Education Director.
2. National Council of Schools of Mathematics and Science (the Metro principal is on its board).
3. National Council for Accreditation of Teacher Education.
4. STEM/Texas.
5. Battelle installations in Tennessee and Washington State.

5.2.4 Learning Partners, Learning Centers and Resources

A large part of the Metro education experience is in the field at various learning centers, such as the Wexner Center for the Arts, Columbus Museum of Art, Battelle and OSU laboratories, the Mayor's Office, SWACO, COSI, and others. Community resources, such as the OSU library, OSU's counselor program, Columbus Public Library, OSU lectures and presentations, and programs and events in the community, are integral parts of the Metro approach. The work of PAST is key in organizing much of the on-the ground learning in the field, integrating STEM pedagogy outside of the classroom, and contributing contacts. Nevertheless, these learning connections require many meetings, discussions, and engagements that link Metro and the learning site so that mutual understanding can be achieved. Initially, the Metro principal was at the core of these connections by "keeping partners in the loop" at both learning-partner and learning-site levels (1019).

At the MPG level, commitments of services and resources have moved over time from partnership to a more *connected relationship* where reciprocal commitments are clearly understood by Metro and its partners. At the Learning Partners or Learning Center level this connectivity is more of a work in progress. From respondent data it is clear that Learning Partners do not always understand the constraints on Metro (e.g., mastery requirements, the Ohio Graduate Test, mixed admissions) and all that it entails. Equally, Metro staff and faculty do not always comprehend the constraints within which the Learning Partners operate. In other words, just as the MPG once had to establish common ground and go through other framing steps identified earlier, Metro and its Learning Partners need to engage in mutual framing. It is an important area of connectivity.

In contrast to the newer and developing Learning Partnership network, the major partners (MPG) have advantages developing their connective status. First, they came together to work and agree on general goals and aims before they proceeded with operational details. Second, as a leadership group they focused on "big picture" items, whereas routine linkages often require more detail and more potential points of contact. The Metro Partnership Group had more of an understanding, and perhaps the capacity to meet the challenges of connection. Battelle provided and continues to provide a great deal of in-kind support through public relations assistance, a liaison project manager, and Battelle employees who actively participate in school clubs, tutoring and mentorship. OSU was less able to financially underwrite support, but nevertheless the university, its administration, and faculty provided wide-ranging expertise and in-kind service commitments.

5.2.5 Curriculum Coordination

Curriculum coordination is an arena of essential collaboration given Metro's learning modes. A single Metro staff person with prior classroom, high school administration, and state education agency experience leads all of the curriculum coordination. The three primary areas of effort include credit for high school graduation, internships, and participation in other institutional educational programming that have partnered with Metro as Learning Centers.

Credit for graduation

Until recently, a series of voluntary teams of content area specialists have followed along the initial curricular design teams to convert Metro classes and experiences into allowable credits. The teams are organized by subject and are comprised of OSU professors and classroom master teachers from the districts. These representatives look at the total learning experience, classroom and hands-on, with input from teachers and project coaches. In most cases the raw data is course learning outcomes and an exhibition portfolio from a project.

At the end of each term, Metro provides the home school district of each student with a transcript, which is converted to credit equivalents. To graduate, the conversion total must equal the 18 required credits. Metro credits are transformed into district "graduation planners," particularly in such core areas as Math, Science, Social Studies, and English (1024).

In the first year of Metro operation, the transformational work of the curriculum committees was presented to school district staff. In regard to Columbus City Schools (60% of students), for example, the Metro principal and the Columbus City Schools' lead counselor compared results on a student-by-student basis. The Metro mastery model demands individual evaluations, unlike the 22 Columbus high schools where courses are compared. Metro students are supposed to be in contact with the home district's high school counselors, but few do because they are so "bound up with Metro" (1024). This assessment process is therefore of even greater import. The coordinated assessment looks for "student road blocks, flags, and potential problems" (1024). Also, curriculum coordination at this level requires constant communication and information transfer between the Metro staff, including the secretary and receptionist, and the Home Schools.

Internships

All Metro students have to fulfill an internship. Most of the internships are intentionally located at sites that lead to STEM careers. Internships include public, non-profit, and private sector agencies. Pilot internships began in the second year but the majority of internships are intended for third and fourth year students. Internships are set up with Metro's Learning Partners, such as Battelle, COSI, OSU Greenhouse, OSU Supercomputer Center, and Franklin Park Conservancy, where some students will also be taking classes. This all requires considerable reaching out, finding suitable learning experiences, establishing mutual expectations, in-process monitoring, and assessment of outcomes.

Learning Centers

Dedicated, off-site Learning Centers will provide internships, and, in some instances, classroom experiences for third and fourth year students at places such as Battelle, COSI, and Franklin Park Conservancy. Since the Metro building will have no space for the juniors and seniors, classes in engineering, botany, and photography classes for up to 18 students will be held at these centers. The health/physical education requirement for graduation also requires cooperative effort of Learning Partners and the Learning Centers. RPAC (Recreation and Physical Activity Center) at OSU and the PAST summer studies programs provide the Metro students with the needed health/physical education requirements and are building a life-long wellness course. Additional centers are being negotiated with the Museum of Art for art classes and the Columbus Zoo for biology. Again, each of these requires similar bridge-building to that of the internships. Activation of new partners is a continuing process at Metro.

5.2.6 School Districts

Metro relies on the 16 school districts' administrators and counselors to promote interest and generate applications. Superintendents and school boards are the liaisons with the Greater Columbus communities and positive or negative opinions regarding Metro resonate with Metro leaders. Some boards have expressed hostility to the cost of transferred tuition associated with individual students. Others have expressed that math and science instruction/education in the Home School is superior, so that there is no need to send students to Metro (1007). Other boards, however, are highly supportive. Two districts have followed the suggestion of their superintendents to "buy in" unfilled Metro slots from other district allocations (1007). These districts see Metro as one important alternative to the traditional large high school.

Contact with assistant superintendents over academic-related or discipline-related controls are prevalent. Contacts are less frequent, but notable, over matters of instruction and the grading/mastery nexus of evaluating students. Discipline issues also come up. Although Metro has a code of conduct, it does not have its own discipline code, so the Home School district is relied upon, which sometimes can lead to having to resolve conflicts between the codes of two districts (e.g., a fight at school).

In addition, connections with the home schools are made through district counselors. They are in a good position to promote Metro as an alternative for students. Also, the counselors are an important conduit to the promotion of public understanding regarding the concepts of Mastery and articulating the equivalency of credits between Home Schools and Metro.

5.2.7 Other Notable Linkages

Those in network-champion and leadership positions (e.g., MPG administrators) have tried to constantly nurture public leadership. Two examples are the Columbus Mayor and City Council. One discussant notes that, "While not involved in the design (or operation), they have important strength and are people who know what they are doing" (1002). Also previously identified were state leaders in the governor's and legislative leadership offices.

Within OSU, the core deans spent a lot of time at the beginning informing and educating their faculties and the administration. OSU was characterized as "college-centric," so the President's Cabinet became an important collaborative venue (1014). Once Metro became a university partnership initiative, the deans had to listen to "why we were (once again back) in the business of growing a school" (1014). There was a lot of apprehension, in as much as most universities had divested themselves of laboratory schools over four decades ago. The core deans played on the corporate support for STEM, particularly the math and science "buy-in" for prospective OSU majors. The Trustees were sold on the basis of this being an innovative, "information-age" initiative, particularly with Battelle commitments (1014).

Another set of collaborative linkages exists between Learning Centers and the administration. For example, PAST representatives work directly with the principal over program issues, grants, and field learning experiences. On learning projects, PAST works with teachers and OSU graduate interns on developing learning experiences and on a research agenda surrounding new programs, some of which are basic research and some are pedagogical. Thus, PAST has nurtured and maintained links with both OSU and Metro.

5.2.8 Graphic Depiction of the Metro Multi-Organizational Network

Figure 1 maps out Metro's major relationships, clearly displaying that this is a networked public undertaking. This snapshot captures the major relationships that comprise the Metro networked entity in two dimensions, which is the way the relationships were envisioned as the school was being designed. The core of the school (circle) includes the principal, the small clerical/outreach staff, teachers, and 204 on-site students. The educational mission, guided by its adaptation of CES small-school principles, is connectively partnered by a host of parts that comprise the whole. One source of school policy is among

administrators, teachers, and students who conduct Town Hall Meetings and other forms of what the students have called *stemocracy*.

Policies that require decisions are discussed and reviewed by the Metro Partnership Group, which is comprised of representatives from Battelle, OSU, the Ed Council, and KnowledgeWorks. The recommendations of the Metro Partnership Group are then approved by the 16 superintendents of the Ed Council. Adjacent to the Ed Council and the Metro Partnership Group, on the right in the diagram, are state government educational requirements while on the left is a learning partner, KnowledgeWorks, which is Ohio's connection with the national Coalition of Essential Schools (CES). Moving counterclockwise around the Metro circle are the entities and resources at OSU: counseling services, teaching assistants and tutors, the library, courses taught at OSU, and the involvements of the John Glenn School of Public Affairs and Battelle. Major learning centers and partners in addition to Battelle are listed near the bottom of the diagram, as is the PAST Foundation, which is responsible for the Metro research project, field learning experiences, and the dissemination of learning experiences out to the 16 school districts. Finally, there are the parents and afterschool activities connected directly to Metro.

Now that the school and the network are fully functional, a three-dimensional representation offers a more accurate depiction of the network. Figure 2 visually captures the networked universe of Metro. The centrally positioned, blue circle represents Metro: the staff, faculty, and students. Orbiting around the school is the network in its entirety. The Metro Partnership Group (Battelle, OSU, Ed Council and KnowledgeWorks) is represented by individual red circles, similar to Metro, revealing their connectivity and the importance of their oversight. Each member of the MPG represents a collective of Learning Partners and programs displayed as smaller green globes, which orbit around their main partner. The Learning Partners not directly attached to one of the four Metro Partnership Groups represent a loose collective portrayed in teal. A number of Learning Partner connections result in secondary connections, such as the graduate assistants assigned by individual OSU departments to Metro and the programs developed out of the Program Design Center and PAST. These are displayed as light blue globes. All globes inside the orbit of the Metro Partnership Group maintain direct contact with Metro faculty and students.

As static snapshots, Figures 1 and 2 reveal a great deal about the critical organizational linkages, but there is a lot that is not told. A day in the life of Metro would reveal many different connections that support the school and enhance the STEM learning experiences. Government elected officials, former astronauts, renowned scientists, major project engineers, leading journalists, and others regularly visit the school and the students. Visiting faculty and administrators interested in observing the Metro model receive guided tours of the school by Metro students. OSU professors teach calculus and lecture on myriad topics from humanities to pharmacogenomics. Counselors from the 16 participating school districts visit to negotiate credit equivalents. Mentors and tutors arrive at the end of the school day to continue the STEM experience through after-school programs and clubs. Three times each year, parents, students and faculty meet through evening Town Hall Meeting forums to address issues and ensure ongoing communication.

5.3 Network Analysis

In addition to mapping the extensive linkages between the sectors that Metro as an organization has made with numerous partners, it is possible to identify and analyze the person-to-person connections that constitute Metro operations and governance. Such an analysis serves four purposes:

1. It shows the total array of connections that were reported by the respondents to the questionnaire;
2. It describes who interacts with whom for various activities;
3. It demonstrates the network participants that serve critical roles within the network; and
4. It allows us to see patterns that may not be revealed through analysis of the guided discussions.

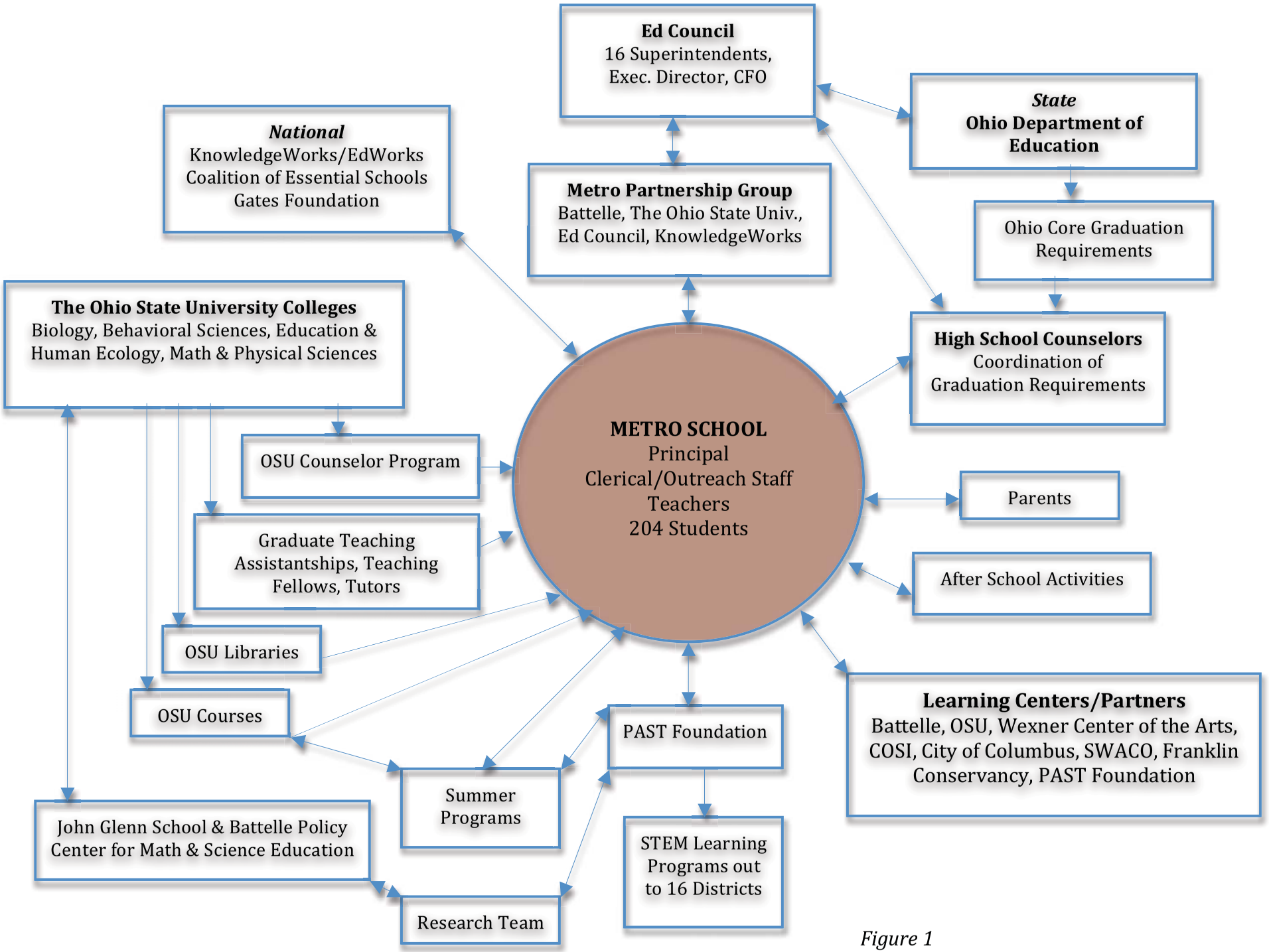

Ed Council
16 Superintendents,
Exec. Director, CFO
State
Ohio Department of Education
National
KnowledgeWorks/EdWorks
Coalition of Essential Schools
Gates Foundation
Metro Partnership Group
Battelle, The Ohio State Univ.,
Ed Council, KnowledgeWorks
Ohio Core Graduation Requirements
The Ohio State University Colleges
Biology, Behavioral Sciences, Education &
Human Ecology, Math & Physical Sciences
High School Counselors
Coordination of
Graduation Requirements
METRO SCHOOL
Principal
Clerical/Outreach Staff
Teachers
204 Students
OSU Counselor Program
Parents
Graduate Teaching
Assistantships, Teaching
Fellows, Tutors
After School Activities
OSU Libraries
OSU Courses
Learning Centers/Partners
Battelle, OSU, Wexner Center of the Arts,
COSI, City of Columbus, SWACO, Franklin
Conservancy, PAST Foundation
PAST Foundation
Summer
Programs
John Glenn School & Battelle Policy
Center for Math & Science Education
STEM Learning
Programs out
to 16 Districts
Research Team

Figure 1

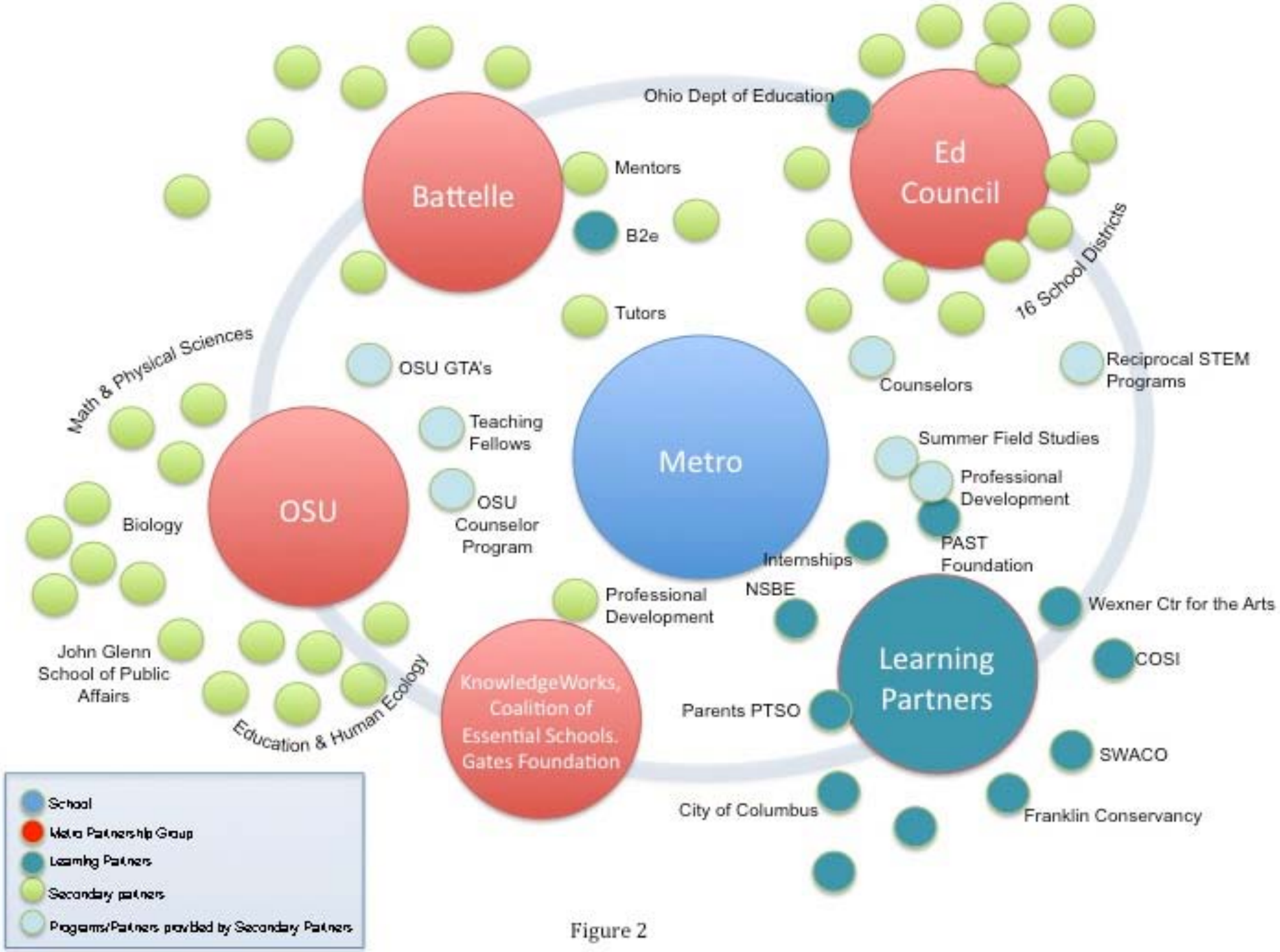

Battelle
Mentors
B2e
Tutors
Ohio Dept of Education
Ed Council
16 School Districts
Counselors
Reciprocal STEM Programs
OSU GTA's
Math & Physical Sciences
Teaching Fellows
OSU
OSU Counselor Program
Biology
Metro
Summer Field Studies
Professional Development
PAST Foundation
Internships
NSBE
Professional Development
John Glenn School of Public Affairs
Education & Human Ecology
KnowledgeWorks, Coalition of Essential Schools, Gates Foundation
Learning Partners
Wexner Ctr for the Arts
COSI
Parents PTSO
SWACO
City of Columbus
Franklin Conservancy
School
Metro Partnership Group
Learning Partners
Secondary partners
Programs/Partners provided by Secondary Partners

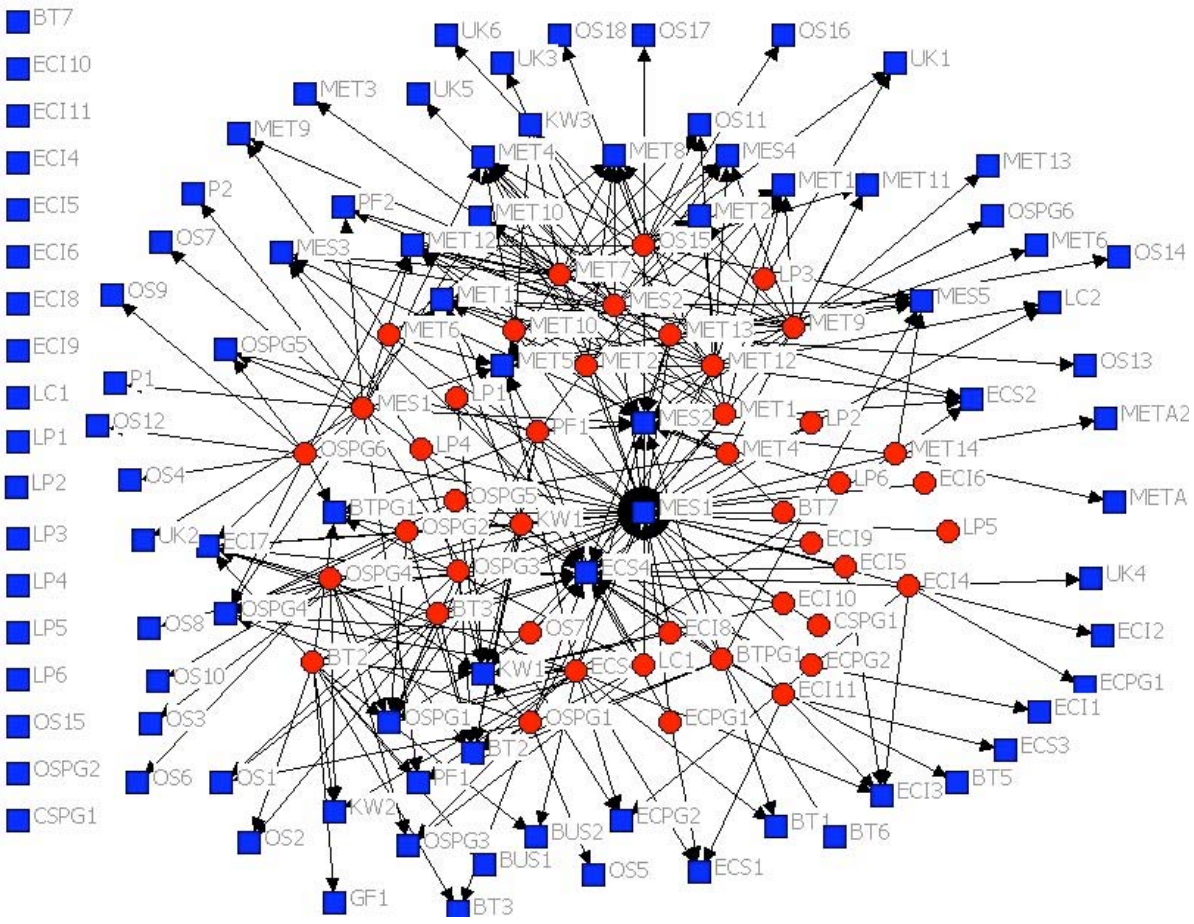
Figure 2

Various mathematical measures can portray the properties of networks, but the best method for achieving these purposes is to display the Metro networks pictorially. This section will thus rely on graphical/pictorial representations of the total Metro network and various sub-networks.

Figure 3 shows the totality of the Metro social/professional network as described by 44 respondents. Although 54 questionnaires were filled out, nine were not used because of their non-policy involvement positions (and thus were not participants in the extant network) and another was incomplete. Even so, the 44 used questionnaires resulted in a total of 76 different contact connections. The 44 respondents included representatives from Metro, Battelle, the Educational Council, OSU, the Metro Learning Partners, teachers, and the PAST Foundation. The red circles in Figure 3 (and each succeeding figure) represent the respondents to the questionnaire and the arrows pointing away from them are the contacts named by each respondent to the questionnaire. The blue squares, which have arrows pointed at them, represent the contacts that were named as part of the each respondent's network. At first glance, Figure 3 looks quite *messy* and very complicated. As shown, the *whole* Metro network is vast and comprised of many different connections—310 in all.

Figure 3

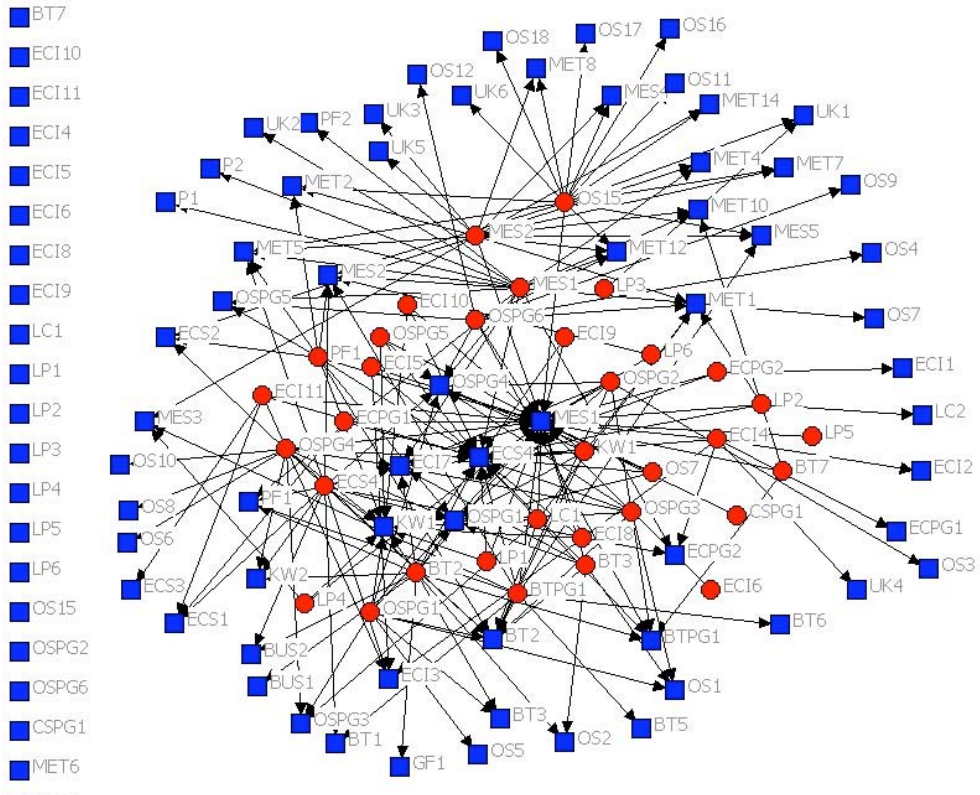
The complete Metro network is displayed with the red circles representing the total respondents (44) and the blue squares in the diagram representing the persons named by the respondents as network participants (76). The blue squares on the left (18) that are not connected to the network represent the respondents who were not named by any other respondent. Note that a respondent named as a network participant is represented both as a red circle and also as a blue square (e.g., MES1, MES2). The nearly complete black circle around only a few of the network participants (e.g., MES1, ECS4) depicts a large number of arrows pointing to that participant, which suggests the significance of that person to the network.



Looking more closely at the picture, however, reveals that a few network participants have many more connections than others. For example, the boxes representing MES1, ECS4, and MES2 have many more arrows moving toward them (meaning they were named as being part of a respondent's network) than the other boxes. Whereas most respondents named fewer than 16 network participants as being a part of their network, MES1 was still named a total of 42 times; only one respondent did not name this person (not including MES1's responses). The seemingly dark circle around MES1 constitutes 42 arrows directed at it. The pattern is relatively clear, even from this complicated picture: MES1 is very central in the network. This first cut as representing the total network definitely suggests some interesting patterns that are discussed further in this section.

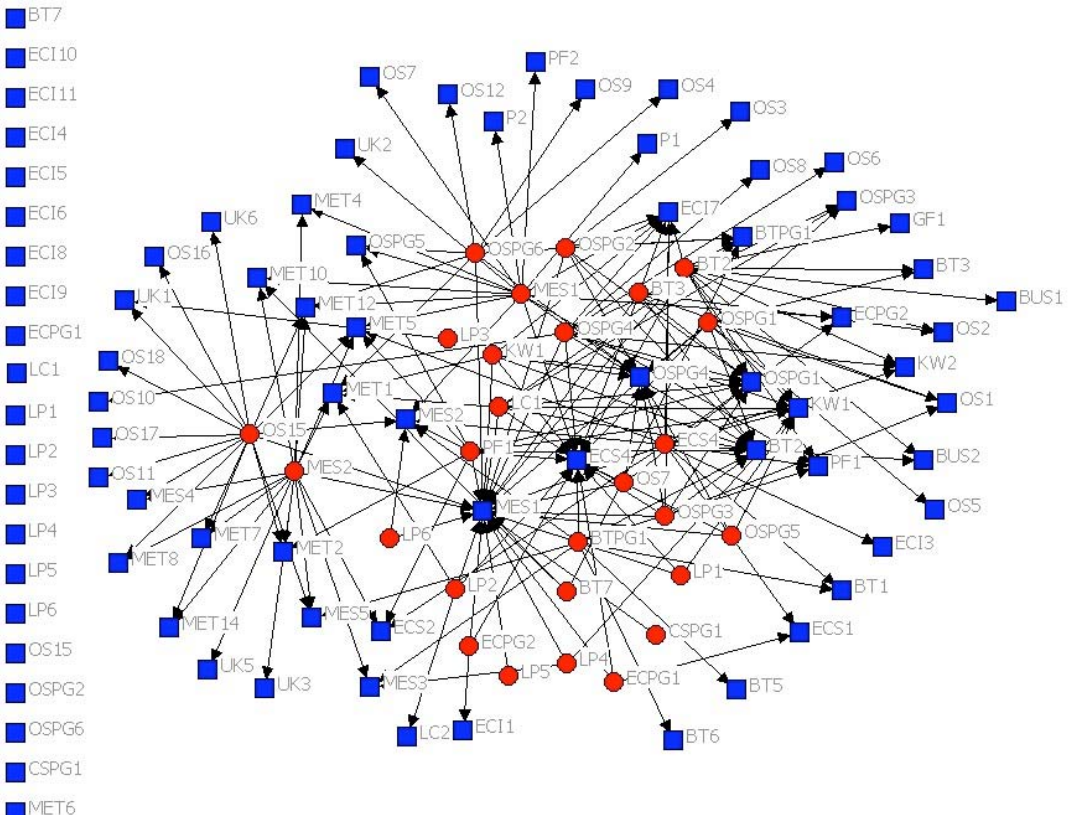
Ten teachers completed the questionnaires and it was revealed that their *network* is much less connected externally than the other 34 respondents. The teacher network is very insular—that is, they essentially name each other as their network connections—and therefore appear to be a separate entity from the professional Metro network. In order to capture the non-teacher included network, the ten teachers were removed from the analysis. This network displayed in Figure 4, which shows a network with many fewer connections (218 in total), better represents the combination of internal and external connections that comprises the Metro network. The pattern of centralization within the network is the same, with 32 of the 33 respondents in this network naming the MES1 as being part of their network (not including MES1's responses). Other more prominent and apparently central network participants that are not obscured in this picture include KW1 and ECS4.

Figure 4
This figure depicts the Metro network without the responding teachers (10) (coded as MET). The red circles represent the non-teacher respondents (34) and the blue squares represent the persons named by the respondents as network participants (73). The blue squares on the left (21) that are not connected to the network represent the respondents who were not named by any other respondent. Note that a respondent named as a network participant is represented both as a red circle and also as a blue square (e.g., MES1, MES2). The nearly complete black circle around only as few of the network participants (e.g., MES1, ECS4) depicts a large number of arrows pointing to that participant, which suggests the significance of that person to the network.



Although superintendents represented on the Ed Council (coded ECI) participate in decision-making for Metro-related issues, their connection to the network appears in Figure 4 to be non-existent. Seven of the superintendents, who are not members of the Metro Partnership Group, completed a questionnaire; none of them were named by other respondents as being part of the Metro network. In order to more accurately show the Metro network, these non-MPG superintendents' questionnaire data were removed from the analysis depicted in Figure 5. This figure thus shows the Metro network as reported by the remaining 27 respondents. The 73 participants named by the 27 respondents still represent a relatively large network (194 total connections), but it also more accurately demonstrates the centrality of MES1, ECS4, and OSPG1. Many network participants have just one arrow pointing to them, which signifies being named to the network by just one of the 27 respondents. This reveals the peripheral status of many persons as well as the critical few nodes in the Metro network.

Figure 5
The Metro network is shown without both the responding teachers (10) and the responding superintendents who are not part of the Metro Partnership Group (7) (coded as ECI). The red circles represent the respondents (27) and the blue squares represent the persons named by the respondents as network participants (73). The blue squares on the left that are not connected to the network represent the respondents who were not named by any other respondent. Note that a respondent named as a network participant is represented both as a red circle and also as a blue square (e.g., MES1, MES2). Many network participants (blue squares) have just one arrow pointing to it, which shows the peripheral status of many participants.



One way to demonstrate the flatter but less externally connected nature of the teacher/staff Metro network is to isolate just the 10 responding teachers (coded MET) plus the primary staff of the school (coded MES1 and MES2). Figure 6 depicts a network where MES1 is still central, but not to the same relative degree as in the other networks. Indeed, 124 connections are reported with MES1 being named by every respondent, but the teachers named primarily other teachers in their network. The most revealing non-linkage is shown by the blue squares on the left representing the six Learning Partners

(LP1-LP6); no connections are charted between teachers and these important persons. The figure thus reflects a multi-connected, but still insular, network.

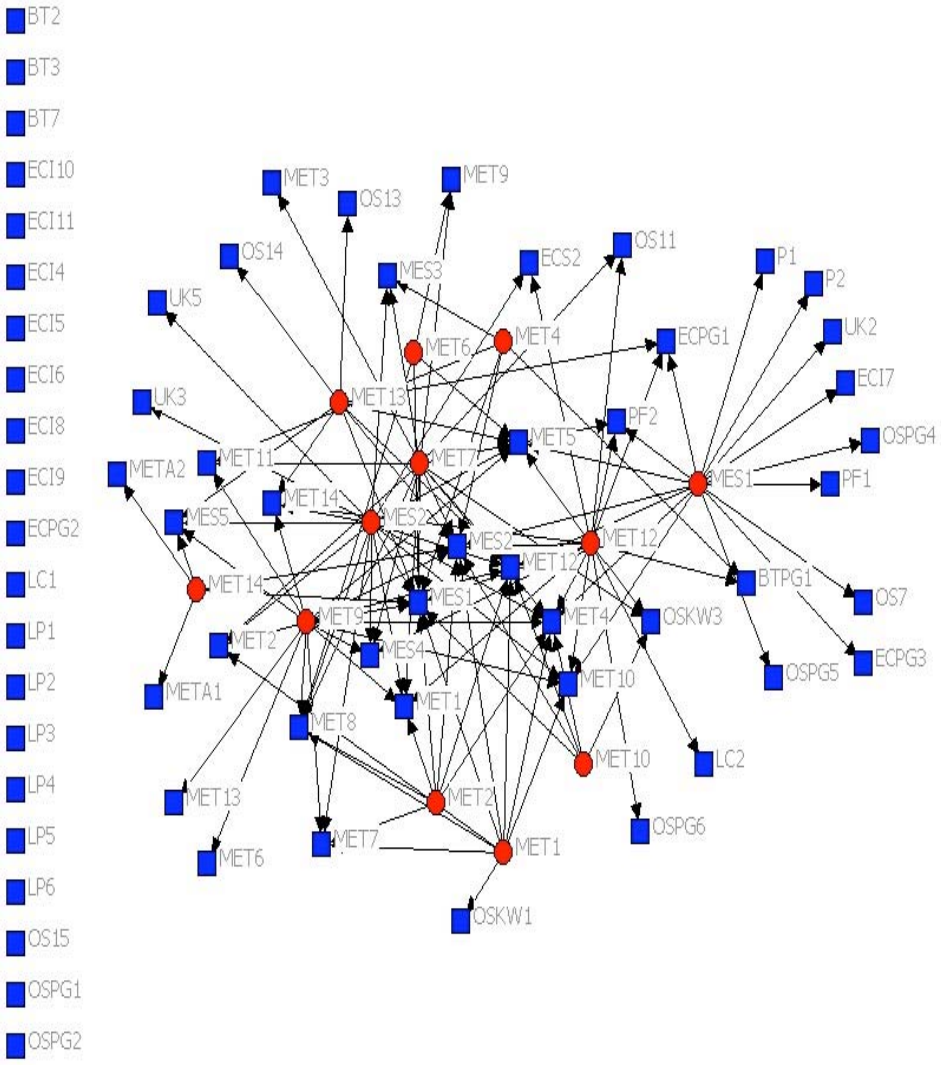


Figure 6
This figure displays the network of the responding teachers and staff of Metro (coded MES). This subset shows the multiple connections across the smaller network of teachers and staff with fewer connections to external persons within the network. The red circles represent the respondents (12) and the blue squares represent the persons named by the respondents as network participants (73). The blue squares on the left that are not connected to the network represent the network participants who were not named by any respondent. The insularity of the network is suggested by the many dark circles around the participants coded MET.

The squares on the left of Figures 3, 4, and 5 show many participants who revealed their network by completing the questionnaire, but were not named by other respondents. In order to isolate the ties of the 27 non-teacher and non-Metro Partnership Group respondents, Figure 7 displays the network just for the 27 respondents. This much more *manageable* network represents the ties of those more-central persons who completed the questionnaires (105 total ties between the respondents). Since most of these 27 respondents were confirmed to be the core of the Metro network through the guided discussions and from the questionnaires completed in the first round of data collection, this 27 x 27 network is considered representative of the whole.

Figure 7 repeats a similar pattern with regard to the central network participants, but another network participant, OSPG4, is also highlighted with numerous contacts. These network participants represent both Ohio State and the Metro Partnership Group. All the figures discussed thus far reveal that a pattern of critical professional relationships is emerging. Figure 8 displays the same pattern of relationships, but it notes ties that are either reciprocal or non-reciprocal. Reciprocity, that is, naming and being named by the same respondent, is shown by the thicker red lines. The relatively few reciprocal lines provide more conclusive evidence that the Metro network has a few centrally-located participants.

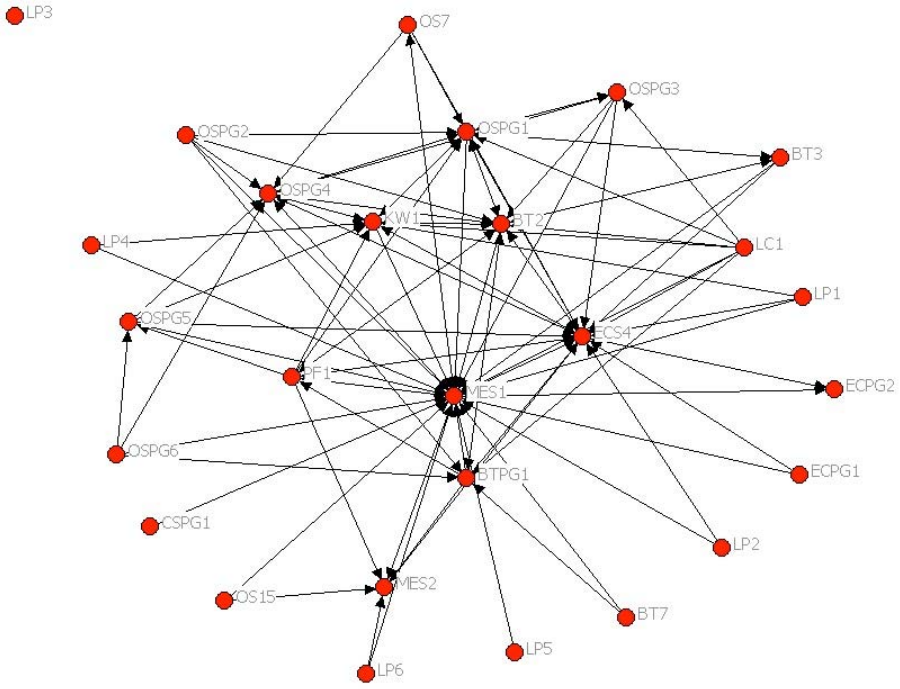


Figure 7
The smaller network depicted here represents only the respondents (27) (removing the teachers and the non-Metro Partnership Group superintendents). The red circle on the left that is not connected to the network represents the respondent who was not identified by any other respondent. Even looking only at just 27 respondents, the center of the network is clearly indicated by the black circle around MES1.

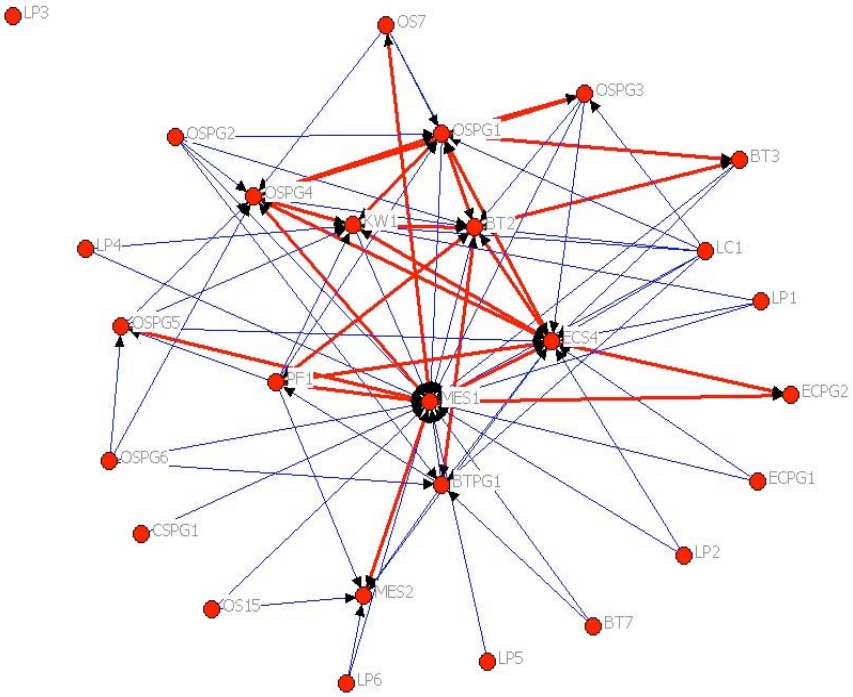


Figure 8
This figure represents the respondents (27) shown in Figure 7. The thicker red lines depict reciprocal (two-way) ties and the thinner blue lines depict non-reciprocal ties. The red circle on the left that is not connected to the network represents the respondent who was not identified by any other respondent. The relatively few reciprocal ties suggest a small network of key participants.

This pattern can also be shown through mathematical measures of two distinct properties of networks: *centrality* and *density*. Measures of centrality address whether a participant in a network occupies a central or more peripheral position in the network based on the number of connections it maintains with other persons. *Degree Centrality* is calculated by the number of direct ties maintained by a person with others in the network. Network participants who have a greater number of ties to other network

participants are generally viewed as being in advantageous positions in the network. More specifically, *In-Degree Centrality* for the networks is measured in terms of the links from one respondent to another (depicted as arrows moving toward the network participant). *Betweenness Centrality* is a measure of the extent to which a participant's position in the network lies between the positions of other participants. In essence, it roughly measures who the main "gatekeepers" are in the networks (Provan et al. 2007). A *Betweenness Measure* adds up, for each network participant, the number of times that they are *between* other network participants. Finally, density is a calculation of the proportion of all possible ties that are actually present within a network.

Table 5-1 lists the five network participants with the highest measures of centrality, both in-degree and betweenness, in the networks displayed in Figures 7 and 8. The extant network consists of network

Table 5-1: Central Participants in the Metro Network of 27 Respondents

Central Participants (In-Degree Centrality)	Central Participants (Betweenness Centrality)
1. Metro Principal (MES1)	1. Metro Principal (MES1)
2. Educational Council CEO (ECS4)	2. Educational Council CEO (ECS4)
3(t). Battelle Vice President (BT2)	3. Battelle Vice President (BT2)
3(t). Professor and Former Dean, College of Education and Human Ecology, Ohio State University, Metro Partnership Group (OSPG1)	4. Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)
5(t). KnowledgeWorks, Senior School Designer (KW1)	5. Professor and Former Dean, College of Education and Human Ecology, Ohio State University, Metro Partnership Group (OSPG1)
5(t). Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)	
Total Ties: 105 In-Degree Centrality: 78.92% Density: 14.96%	

* Degree centrality is calculated by the number of direct ties maintained by a person with others in the network. In-degree centrality for these networks is measured in terms of the links from one respondent to another. Betweenness centrality is a measure of the extent to which a network participant's position in the network lies between the positions of other network participants. A betweenness measure adds up, for each network participant, the proportion of times that they are "between" other network participants. Density is a simple calculation of the proportion of all possible ties that are actually present within a network.
** The numbers in each column reflect the ranking of the centrality score for each network participant. Scores that are identical are noted with a "t."

participants who were instrumental in the formation of Metro (as earlier discussed) and continue to be critical players. In-degree centrality measures show that all critical organizations are represented in the top six (with ties at third place and fifth place): Metro, the Ed Council, Battelle, Ohio State University representatives on the Metro Partnership Group, and KnowledgeWorks. Although in a slightly different order, the same five network participants are at the top of betweenness centrality, with the exception of the representative from KnowledgeWorks. These important findings are consistent with the conclusions of the discussant interviews: all five institutions are critical to the operation of Metro. The in-degree centrality measure (78.92%) reveals a very centralized network in

terms of who is being named as part of the network. The density measure also suggests that fewer network participants have linkages with one another than are possible: just under 15% of all possible ties in the 27 x 27 network are present. This combination of a high centrality measure and a low density measure suggests that relatively few of all possible linkages are being made, and those that are made are typically through just a few main network participants.

The network ties are driven largely by information. In order to isolate the frequency of exchange, a sub-network was examined that represents only those network ties that are noted to exchange information the most regularly (at least monthly). Figure 9 shows a much smaller network (66 total ties) with many network participants that do not link with others on a daily, weekly, or monthly basis (see the 13 network participants on the left of the diagram who are not regular communicators with the rest of the network). Table 5-2 shows that there are fewer ties in this network (density equals just 9.40%) and that largely the same network participants are central. The KnowledgeWorks representative drops out of the top five for each of the centrality measures. In terms of centrality for regular information exchange, the Battelle Project Manager in Residence at Metro assumes a position of increased importance.

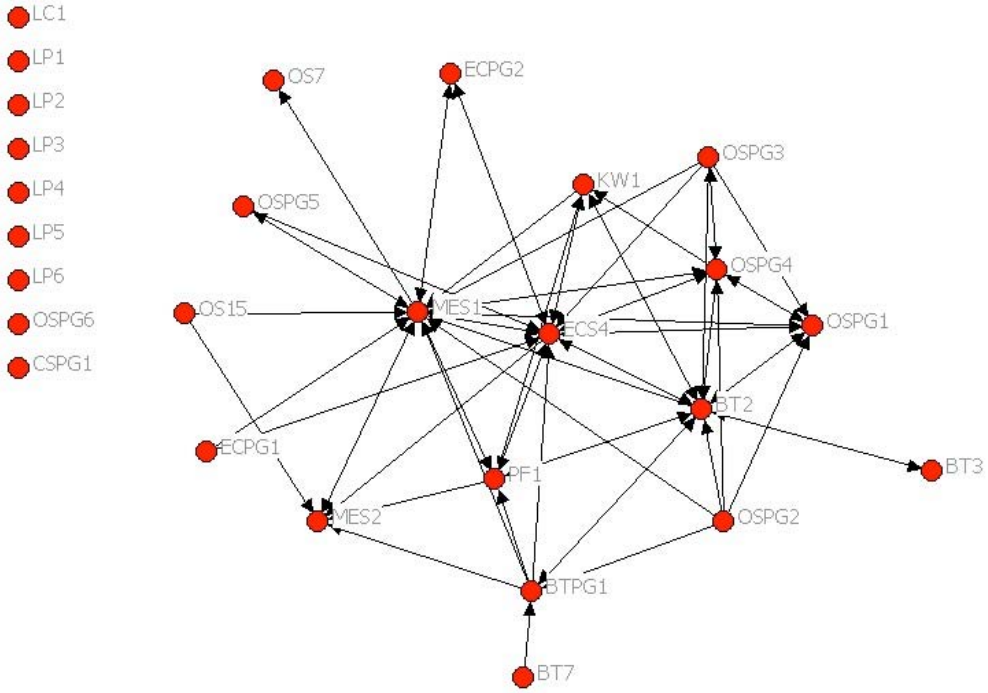


Figure 9
The much smaller network depicted here represents just the network of respondents (27) (removing the teachers and the non-Metro Partnership Group superintendents) who reported that they ***exchange information*** *on a regular (at least monthly) basis with the other respondents (18). The red circles on the left that are not connected to the network and represent the respondents (9) who do not engage in regular information exchange. This figure demonstrates the relatively small network of participants involved in both sending and receiving information, and suggests a lack of communication with the Learning Partners (coded LP).*

Planning is an important activity for Metro. As Metro evolves, new curriculum must be developed, funding mechanisms must be identified, and stakeholders must be included. Indeed, who plans is as important as the plan itself. Since Metro operates as a network, the planning should be collaborative rather than single-source, or at least involve representatives from the organizations who play a primary role in operations. Figure 10 confirms that joint planning occurs among the critical network participants, but fewer network participants are involved than for regular information exchange. Table 5-3 shows that the Metro principal remains at the center of joint planning and the network participants from the information exchange network are also the most central to

planning. As in the information exchange network, the density of ties is low (9.83%) and the in-degree centrality (50.77%) is much lower than for the networks displayed in Figures 7 and 8.

Table 5-2: Central Participants in the Metro Information Exchange Network of 27 Respondents

Central Participants (In-Degree Centrality)	Central Participants (Betweenness Centrality)
1. Metro Principal (MES1)	1. Metro Principal (MES1)
2. Educational Council CEO (ECS4)	2. Battelle Vice President (BT2)
3(t). Battelle Vice President (BT2)	3. Educational Council CEO (ECS4)
3(t). Battelle Project Manager (BTPG1)	4. Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)
5. Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)	5. Battelle Project Manager (BTPG1)

Total Ties: 66
In-Degree Centrality: 47.85%
Density: 9.40%

* Degree centrality is calculated by the number of direct ties maintained by a person with others in the network. In-degree centrality for these networks is measured in terms of the links from one respondent to another. Betweenness centrality is a measure of the extent to which a network participant's position in the network lies between the positions of other network participants. A betweenness measure adds up, for each network participant, the proportion of times that they are "between" other network participants. Density is a simple calculation of the proportion of all possible ties that are actually present within a network.
** The numbers in each column reflect the ranking of the centrality score for each network participant. Scores that are identical are noted with a "t."

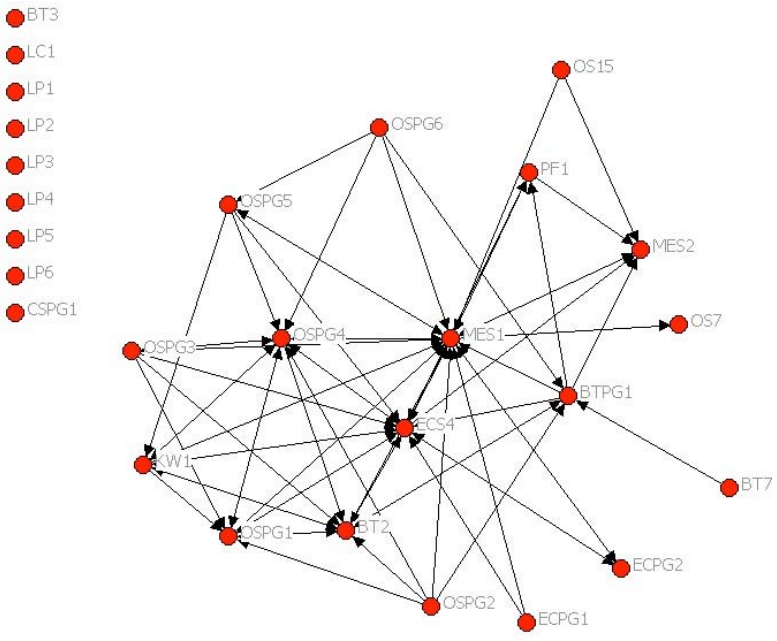


Figure 10
This figure depicts the network of respondents (27) (removing the teachers and the non-Metro Partnership Group superintendents) who reported that they engage in regular (at least monthly) ***planning*** *with the other respondents (18). The red circles on the left that are not connected to the network represent the respondents (9) who do not engage in regular joint planning. Like Figure 8, the planning network is small with a few key participants and does not include the Learning Partners (coded LP).*

Table 5-3: Central Participants in the Metro Joint Planning Network of 27 Respondents

Central Participants (In-Degree Centrality)	Central Participants (Betweenness Centrality)
1. Metro Principal (MES1)	1. Metro Principal (MES1)
2. Educational Council CEO (ECS4)	2. Educational Council CEO (ECS4)
3. Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)	3. Professor and Dean, College of Biological Sciences, Ohio State University, Partnership Group (OSPG4)
4(t). Battelle Vice President (BT2)	4. Battelle Project Manager (BTPG1)
4(t). Battelle Project Manager (BTPG1)	5. Battelle Vice President (BT2)

Total Ties: 69
In-Degree Centrality: 50.77%
Density: 9.83%

* Degree centrality is calculated by the number of direct ties maintained by a person with others in the network. In-degree centrality for these networks is measured in terms of the links from one respondent to another. Betweenness centrality is a measure of the extent to which a network participant's position in the network lies between the positions of other network participants. A betweenness measure adds up, for each network participant, the proportion of times that they are "between" other network participants. Density is a simple calculation of the proportion of all possible ties that are actually present within a network.
** The numbers in each column reflect the ranking of the centrality score for each network participant. Scores that are identical are noted with a "t."

The findings from this analysis highlight several important points. First, the number of ties in the networks is substantial. Although the respondents were limited to listing just 16 network participants, 310 ties exist in the total network (44 respondents, total of 76 network participants), 218 when the teachers are removed (34 respondents, total of 73 network participants), and 194 in the network without teachers and non-MPG superintendents. The ties in the networks depicting regular information exchange and joint planning were also substantial. On the other hand, the number of ties in the network depicted in Figure 3 is very small compared to the total possible ties, when considering a 44 x 76 matrix (the data used for Figure 3). The extremely low densities in the networks, in conjunction with the relatively large in-degree centralization, suggest a number of peripheral network participants in the network. Peripheral does not necessarily mean unimportant, but the questionnaire data do reveal small social networks within the context of larger professional networks. The networks in Figures 7-10 *filter out* some of the noise in the data by not including many network participants that are peripheral in terms of the Metro formation and operation.

Second, the principal of Metro occupies the most central and thus the most important position in the network. The influence of the principal, in terms of information exchange, planning, and involvement on projects, cannot be understated. Just one respondent did not name the principal as being part of the network, and this person was, as it turned out, more peripheral to the overall network. However, it's important to point out that at no time during the 28 guided discussions was there any animosity expressed or a feeling by anyone that the principal possessed too much power. Since the principal was hired early in Metro's creation, it may be that there has been more acceptance of her central role in the network. Additionally, the principal obviously involves other individuals in Metro's operation. The tables showed that although the principal is central, representatives from Ed Council, Battelle, the Metro Partnership Group, and Ohio State University also fill an important position in the network and sub-networks.

Third, as one would expect, the role of the CEO of the Ed Council is important. The number of linkages for this individual in all networks is second only to the Metro principal. As the CEO of the entity that operates Metro, that position should be central to the network, and it clearly is. And the linkage between this individual and the principal of Metro is obvious from the data. Of the 24 ties reported with the Ed Council CEO, 23 of them also report that the Metro principal is a part of the respondent's network.

Finally, while most networks possess a technical core that does most of the hands-on interaction, individuals from the top of their respective organizations are involved regularly in Metro providing and receiving information, as well as planning collaboratively. A lesson to be learned from the Metro network and sub-networks is the importance of having the right people and resources on board, mobilizing support, and establishing legitimacy. Achieving such goals is much more likely when the heads of the organizations are involved on a week-to-week, even day-to-day basis.

It will be important for the core linkages between the school principal and the governance bodies—the Ed Council and the Metro Partnership Group—to be maintained as Metro grows in size. Will the size of the network grow as enrollment grows? Should it? Most observers of networks agree that it's not the size of the network that matters but rather the scope and strength of the linkages within the network. That is, the *whole* network displayed in figure 3 isn't notable because of the number of linkages; it's the critical linkages that exist, and some that do not, that are the most important. *Too big* is rarely an issue in networks unless the many participants that have been activated into the network obstruct, constrain, or otherwise inhibit effective network operations. There is no evidence that the Metro network is so imbalanced in terms of power and influence that the network has not been successful.

The network is imbalanced, however. The principal and the CEO of the Ed Council are clearly the most influential participants in any network activity, be it planning, project involvement, or simple information exchange. Other network participants named these two persons the most frequently as being part of their Metro network and statistical analysis confirmed the centrality of this dyad. Such a network model is similar to research on other networks in economic development (Agranoff and McGuire 2003), social services (Provan and Milward 1995) and emergency management (Moynihan 2005; McGuire and Silvia n.d.) that suggests a certain level of centralization in a network is critical to a network's effectiveness. This model is sustainable and, given the vastness of the Metro network, preferable to a completely self-governing model where leadership is too dispersed and accountability is elusive.

Each of the networks displayed pictorially show that the six respondents from the Learning Partners were not at all linked into a network. Considering the importance of the Learning Partner placement in the educational experience of Metro students, this lack of involvement (perceived or otherwise) could jeopardize the potential long-term relationship with Metro. As suggested elsewhere in this report, the non-connections between teachers and Learning Partners is particularly striking.

The expansion of Metro into four classes over the coming years will elevate the significance of the staff/teacher/parent network and its linkages with the governing network. According to the questionnaires, teachers mostly name other teachers as being part of their network, and only occasionally did a teacher name someone outside of the school. This more insular professional network thus appears to be distinct from the governance of Metro. How can teachers become more involved in critical planning processes that involve external actors? And should they? Similarly, how will parents become involved in governing Metro, if at all? Should these key stakeholders become more involved in planning and projects? There is evidence in other research that all stakeholders should be a part of any collaborative effort, but the truism remains: having the wrong participants in a small network is much less productive than having the right participants in a large network. The relatively small planning network that exists today (see Figure 10) should grow as long as the teachers and parents establish a stronger identification with school governance.

More than formal structure holds networks together. As a collection of interdependent entities, the network depends on leadership, vision, common principles, knowledge, political influence, strategic positioning, and

trust. The development of a foundation of trust within networks is essential to maintain cohesion, and its significance is discussed in the next section.

5.4 Trust and Engagement

In brief, trust exists at all levels of the network. Trust is well-established among the major partners. It is more mixed among the 16 superintendents of the Ed Council, although it is apparent from the interviews that they trust the Metro administrative staff. Conversely, there is high level of trust between Metro administrators and those on the Metro Partnership Group, a vital arena of trust. At the operating level, trust-building is a work in progress, as Metro acts as a liaison with so many student project learning sites, internship sites, counseling programs and school counselors, learning resources (e.g., library), and classroom experiences. This kind of operating trust is not built quickly or automatically.

At the highest level, among Battelle and OSU, "there are a lot of trust-based relationships" (1002). There is a lot of commitment, explained one partner, to "a deep and long-lasting project that would bring Battelle closer to the campus and that would forge something of great value. That led us into a working partnership around Metro." We built bridges as we "framed something that worked for all" (1002).

The working partners who became the Metro Partnership Group understood what had to be done to build trust. As one member related,

> *Partnering is important, they run faster than organizations. There is no trust-building ropes course. The vision principles helped. Leadership must be involved – use of the distributed leadership model. It provides exposure from different lenses at the table. There was also excitement, hope and lots of war stories and explanations. For example, features of overcoming budget problems, school firsts, and unique policies. People at the table do get the vision and are willing to take risks and take those risks together (1008).*

Another administrative leader attributed trust building to several related reasons: growing to like one another, being respectful of all at the table, establishing time lines to induce production, belief over time that the bad ideas would fall away, but a willingness to "try just about anything." A respondent commented, "if it looked like any other high school, we were not interested nor were we interested in an academy" (1014). Development of a "willing to try" culture was essential. The principal was at the design table from the start and rarely said no to a creative idea, and there were tasks and time lines that were often self-prioritizing and with no one saying "we don't have enough time." "It also helped that we had top-level innovative buy-in, with 'champions at the plate'" (1014).

Some of those at the table had to go through a trust-building process with key partners. There was some concern that OSU, as a large university, might not be amenable to change. "There is a history of mistrust. But the willingness to be honest and the time-consuming process of forming partnerships helped. Also, all put their agendas forward" (1018).

Finally, another top administrator related that the group was able to build on their prior successes in resolving challenges. Regular monthly meetings helped. There was consistency of administrator involvement in the Metro Partnership Group. "People delivered on what they were expected to do on implementation." This involves the "distributed leadership" mentioned earlier (1023).

Ed Council superintendents demonstrated more mixed levels of trust. A number are highly supportive and upfront about Metro not only as an important experiment in STEM education but as a genuine alternative to the traditional high school that can better meet the needs of some students. Some superintendents have to deal with boards—or vocal board members—who do not have the same level of commitment to Metro. Some board members see Metro as a diversion, particularly of funds. Other board members think their math and science programs are superior, so they are reluctant to send students. One or two boards voted to replace sending student funding by charging parents tuition in

reimbursement, only to be stopped short by an advisory ruling by the Ohio Attorney General. Now these boards are contemplating not sending any new students to Metro. The trust-building lesson, related one discussant, is to engage the school boards early in the process, as well as these schools. The boards need to be nurtured (1026).

To some degree mistrust is also said to exist among the school systems themselves. There is suspicion regarding Columbus City Schools place in the mix for historical reasons. Others were somewhat skeptical about the OSU behemoth. Several wondered, "What's in it for them?"

Trust-building in the interactions between Metro and various learning sites is in process as students engage in projects, internships, and other off-site school experiences. Moreover, as one OSU administrator related, "as students move close to OSU courses, a whole new set of trust-inducing expectations arises" (1003). One site representative related that trust is

> *...not totally there. We are learning to understand one another. Their (Metro) focus is coming through. It takes time to build trust. Metro sees us as a resource, but the cooperation must have roots, so someone is there after the dust settles. We believe that what Metro is doing is genuine. Both sides have to appreciate they have to change somewhat* (1009).

Another resource person who is directly on-site at Metro related that more details remain to be worked out. Issues about what contract staff can and cannot do are at stake. There are also issues of the frequency of availability and discontinuities of service that have to be worked out over time. Issues about incompatibility of rules regarding access to community resources like the library have also arisen and are in the process of being resolved.

Working with district counseling staff to accept Metro mastery/portfolios/other learning documentation also is taking time. One district administrator related that, "trust has developed. As something new, it takes time to work." "Some of Metro's first year issues were hard to swallow, particularly how few of our (district's) students made progress at first. But the new added sessions helped the mastery concept" (1024).

It was also related by school district staff that the two parties had to build a common strategy and regularize communication. School districts and boards need to forge partnerships with Metro, but few do the hard work of follow-through. One person reported that she was fortunate, because she had prior experience working with the Ed Council CEO and the principal through CES. Thus, the Metro working relationships were built on an existing foundation.

Another learning site manager agreed that

> *There are some trust issues. They are not unusual. There are a lot of entities involved, all high profile, with lots of exposure of Metro. The school involves a lot of dollars thrown at it—at least that's the perception. Interaction is not always direct* (1019).

There is general agreement that what should be done is consistent with the observation of one learning site representative, who mentioned first that communication builds trust, and that one must lay out the issues and serve as a mediator. This respondent continued by stating that the staff needs to be involved, and that efforts to link and join people together should continue. Third, it is necessary to find other ties, because new connections lead to trust. Fourth, it is important to make it clear that STEM education is part of school reform, and that Metro is more than just a project; it is desirable as a new and innovative undertaking (1019).

Finally, it is important to remember that trust is often the most difficult to build at the implementation level. It is where the devilish details come out and have to be worked through, often individually. The costs in terms of resources such as money, time, and knowledge, come out most directly at this level.

Moreover, the costs that might be absorbed by larger network partners are more transparent among the connecting organizations. It is also clear that while common philosophies or working principles may be worked out at the executive-to-executive or administrator-to-administrator levels, it does not follow that such understanding will automatically translate to the working level.

The small cadre of Metro administrators (Ed Council CEO, principal, curriculum coordinator, Battelle project manager, administrative assistant, and receptionist) appears to display extremely high levels of trust among one another. Interactions are highly cordial, civil, and oriented to the mission of Metro. Mutual respect was articulated and demonstrated repeatedly. This core is involved in continuous engagement with the various linkages, ranging from policy to the routine. The core administrators are working constantly to improve relations with learning centers and resources, and to overcome the legacy of mistrust that many Metro students and parents have accumulated through prior school experiences.

Trust-building in networked entities is critical. It is in many ways an important glue that holds parties together transactionally because of the absence of legal authority and formal organizational hierarchy. It is a process that Metro has recognized, along with a need for expansion. One early participant said that:

> *It reminds me of Dante's 'Rings of Hell.' Trust spread from the champions to top executives and by working with the KW coach and principal. We each worked with one another at our respective rings of hell. A sort of pedagogical level of trust emerged* (1001).

As people honored their commitments and money came in, the middle level of trust was enhanced. "Trust found its level when it was needed each at its respective working level" (1001). Trust is a process that is currently being worked out between Metro and its working linkages.

The level of trust between the Metro principal and the Ed Council CEO, the two central actors depicted in the network analyses, is high and must remain so. Some of this trust-based relationship is due to their involvement in the formation of Metro from the beginning. Some of it is based on the *small wins* achieved by Metro along the way and the concomitant reduction in the perception of the level of risk in the Metro venture. And some of the trusting relationship can be traced to the length of time each has known the other; previous research on networks shows that trust develops as one becomes more familiar with the other. Trust *between* these two participants is therefore apparently strong.

Trust *in* these two critical participants by the rest of the network will be vital as Metro evolves into an established high school. All school districts and learning partners must come to accept Metro as an innovative solution to secondary education and not feel threatened by its existence. Increasing trust in the leadership of the school, the Ed Council, and also the Metro Partnership Group by the community *outside* the Metro universe is paramount to Metro's acceptance. It is expected that, over time, such trust will develop.

Trust is linked to an entity's ability to make decisions and take actions based on those decisions. In networks, decision-making can be more or less centralized, depending on the demands of the network participants. Although the networks displayed in Section 5.3 suggest a relatively central network in terms of information exchange and planning, the decision-making processes of Metro within the MPG follows essentially a non-hierarchical nature not unlike that found within a self-organizing network. That is, decisions are not made from the top of an organization, but from all persons involved. Networks like Metro are therefore "*collaborarchies*," which are entities organized to facilitate mutual learning, interactive agreements, and interdependent operations (Agranoff, 2007, 83). Such entities expand and perform by building on knowledge growth, which is the currency of the information economy. They underscore the importance of Metcalfe's Law (utility = $[\text{nodes}]^2$): the usefulness of a network equals the square of the number of users (Metcalfe, 1995). We turn now to a brief exploration of decision-making and action-taking in Metro.

5.5 Decision-Making and Action-Taking

Most Metro Partnership Group respondents asserted that after agreement was reached on issues such as autonomy, size, STEM focus, and mastery, the bulk of decision-making involved the commitments of the partners to deliver on the agreed major investments. As one respondent noted, "That is what is meant to be a founder." A founder had to be comfortable with all of the design features and with who was in charge. "When OSU ended up making lots of commitments, the right pieces began to fall into place" (1002)

Metro Partnership Group Consensus

Metro's Partnership Group defines its roles as:

1. Maintain the partnership,
2. Oversee and support the Metro curriculum, programs, and operations, and
3. Transmission of knowledge to a larger community.

As Metro's governing core, this critical body looks at the primary Metro-related concerns in detail. As the real guiding force for the network, it operates by exploration, discussion, and ultimately consensus. One Metro Partnership Group member said, "We always discuss, never vote" (1014). There are no divided votes in the Metro Partnership Group. If the steering body cannot reach complete consensus, then that time is not the right one to reach agreement One informant relayed that issues come to the table only after all the politics have been played, agreements are established, and the resources are in place (1002). By-laws have been raised as a possibility only recently. Until now, "It is a matter of consensus through discussion" (1014).

The university partner, OSU, was reported by some to be the hardest to keep in the loop. "They are large, territorial, but issues like college credit have to be grappled with. We try to break the mold, they slow down. When they say yes and change the rules, they respond that 'this is considered to be a leak.' But the rest of us want the floodgates to open" (1015).

The most difficult of Metro collaborative agreements are often not over money, but aimed at getting large, established partners to change a long-standing way of operating that is deeply entrenched in standards, regulations, and procedures. One discussant from OSU referred to this process as "moving the mountain" (1014). These kinds of purposeful accommodations often take a great deal of network time and effort. In some cases, the mountain is not moved.

Metro Partnership Group resembles an entity that operates both as a bureaucratic organization and a more open hierarchy that depends on collaboration—a "*collaborarchy*" (Agranoff 2007, 83). The Metro Partnership Group's success in steering the Metro effort is due to five interacting effects, according to one of the founders (1014):

1. First, the commitment of key participants in time was essential. The key participants who ultimately became known as the Metro Partnership Group committed a great deal of time for appraisal, design, and concept building, solidifying their relationships while laying the framework for Metro. Social time together reinforced this.
2. Second, most of the key participants generally did not know one another before the Metro undertaking. The group was brought together over the Metro issue, with a minimum of baggage.
3. Third, the core group did not have official authority. They saw the importance of lining up the key players.
4. Fourth, CES was concerned about not getting the appropriate credit. The group had to make a special effort, reinforcing their 10 principles, although the limits were frequently pushed.
5. Fifth, together the group exercised flexibility and let the project evolve.

Educational Council

This is the official sponsoring body of Metro, comprised of the 16 superintendents. The Ed Council began several years ago, triggered by suburban concern over the City of Columbus annexing and preempting massive amounts of assessed valuation from suburban school districts. As a solution was forged, the Council began to sponsor multidistrict programs like the Christopher Program and Safe and Drug Free Schools. This body oversees several joint programs, and, for Metro, it develops general policies, retention policies, approves school curriculum, and sometimes trades available student slots for Metro between districts. Two superintendents, one from the Columbus City Schools, which represent over 50% of the Metro student body, and the president of the Ed Council, also sit on the Metro Partnership Group. They, along with the Ed Council CEO and Metro principal, bring decision items to the Council from the Metro Partnership Group.

The Educational Council meets once a month with their executive officer and the Metro principal. The council operates meetings by discussion and vote. The monthly meeting agenda is organized by the Ed Council CEO. One Ed Council member noted, "After some talk someone says, 'Hey, do we have enough support to pursue this?'" (1010). *Robert's Rules of Order* are employed and the meeting follows parliamentarian sequence: agenda, discussion, and vote. The meetings also afford the Metro principal time for a progress report on pragmatic issues, new programs, and grants sought and received.

Other Venues

The task forces and design teams, which are the knowledge-building technical bodies, operate more informally, but also are consensus-oriented in making decisions. These teams are guided by the Ohio Graduation Test (OGT) and graduation standards, but because Metro's work is both classroom mastery and experientially-based, they have no choice but to work by consensus. Experts who want to consult and not explore, learn, and reach inter-specialist agreement, generally fall by the wayside. As an all-volunteer effort, it is easier to let such attrition happen, letting the share of learners and consensus-builders rise to the top.

Work on agreements between Metro staff and Learning Partners and learning sites is informal but based in mutual engagement. No one at Metro would send a list of learning components, outcomes, or requirements. It is not done that way. Rather ideas are floated back and forth, examined one-on-one toward agreement, and the details are worked out later. The gatekeeper for sealing such understandings is reported as Metro's principal.

5.6 Accomplishments and Contributions

5.6.1 Metro Accomplishments

Notable accomplishments include the introduction and operation of the mastery approach to learning. As one discussant related, "the dependent variable is, have you learned it, not where or how you learned it" (1014). In this sense, mastery follows some of the best educational systems in the world. Another person related that mastery means "students are learning how to learn" (1026).

Also, learning geared to real world experiences was identified by several persons. "It is the kind of in-depth approach that we all face in the real world" (1008). Another related, "learning was related to the world of work skills." The intensity of learning, for example the two-hour blocks, gives students and teachers the time to link the classroom and the field. Having learning partners and learning sites are key here. "Working with business and other partners/learning sites reinforces the 'reality of the experience' to the students" (1018).

A number of discussants also identified the academic model as being conducive to independent thinking and creative thinking. "Classroom to project work, its problem-nature, leads to thinking on your own about solutions." It also encourages students to begin and practice "thinking outside of the box," an issue identified by more than one discussant (1005; 1018).

In terms of school atmosphere, the building of community between students, staff, parents, learning site persons, and others is critical to a successful Metro. Student engagement in learning develops interest in the school as a place to build community among the various parties in ways that many schools cannot. Instead of being just a place to accumulate graduation credits and become employable, it is also a place where there is mutual interest in building a lasting experience. One person related, "Metro is a place where habits of the mind and habits of the heart can be built" (1027).

This community is comprised of a diverse student body, not only based culturally on gender, ethnicity, and race, and geographically in terms of place of residence, but also a diversity of academic achievement as well. This diversity is reinforced by the Metro shared experience, they related (1001; 1009).

The atmosphere is also conducive to empowering students, who are actively involved in school governance through the town hall meetings and other mechanisms. This, along with integrated learning, contributes to students being engaged and caring about learning.

One clear accomplishment is the act of transformation from idea to operations. Several discussants said that the school opening on time was a major component of success. They also pointed out, however, that the other side of the coin is sustainability. "Can we keep Metro going?" asked one administrator (1026).

A number of the school features identified above are considered to be key accomplishments including the business/university/Ed Council partnerships, multiple off-school learning sites, the small size of Metro, "open-source" learning opportunities captured, flexibility of approaches, and the ability to meet the aspirations of a number of parties. One discussant concluded, "Metro has knitted a cord of aspirations" (1001).

One very clear conclusion is that most discussants felt Metro was well on its way to providing a real chance at learning and educational credentialing to a broad range of young people, some of whom come into the school at quite low levels on standardized achievement tests. The potential for success for many kids who might otherwise drop-out of school is an important achievement. Also, student learning, by doing and working in the community, links to their long term efforts at various forms of public service. Importantly, it is an opportunity to begin civic engagement at a young age.

Finally, Metro is in the process of demonstrating that its model (mastery + STEM + field learning + size + autonomy) can work. It has the potential for a "big footprint" (1014), not only in the potential of stimulating other STEM schools, but as a platform to spread STEM/mastery/field learning to the 16 school districts in Franklin County and beyond. So, too, are the partnership approaches. It is one model for "redefining the high school experience," related one educator who also concluded "this is not a trivial exercise" (1012). The potential for export both in terms of its partnerships with business/industry and higher education, and in terms of its learning approach, can be translated into any number of interesting high school reform efforts.

5.6.2. Metro School as a STEM School

Several previously identified features are considered to make Metro unique as a STEM school by those who created and maintain this high school experience. The most frequent, nearly universal response identified was Metro's relationship with its partners: Battelle, OSU, and the Ed Council. It was more than their resource commitments, but also the energies focused on exploring alternatives and making it work, and their continuing efforts at sustenance, from political and community support through operating learning projects within their structural confines. Thus, the commitment to Metro was much broader and deeper than agreements to cooperate and grant funding. It proved to be a partnership along psychological issues, social ties, time and energy, knowledge sharing, management, and decision-making dimensions.

Learning experiences that emphasize individualization, integration of classroom and field, non-traditional classrooms and laboratories, unique student research experiences, and the state-of-the-art facilities were all pointed to as representative of the STEM-oriented content. Clearly, Metro is a model of STEM

education that is *college preparatory* as opposed to *vocational-technical* and which, of course, is not a *gifted-and-talented* school. This is quite notable, many mentioned, because the common identification with STEM education is as a high achieving, student *academy* experience.

Metro is also more than a STEM school. It combines small school principles (the CES 10) and mastery with heavy doses of relevant experiential learning and aspires to be a laboratory for principles of math and science pedagogy for other schools. STEM education at Metro goes well beyond classroom instruction in science and mathematics; it is thoroughly integrated with instruction in languages, literature, social studies, and other fields of study.

Most important, Metro tries to accomplish these aims by building a community of students, parents, teachers, professors, learning-site representatives, and leaders in government and non-government organizations. The building of community appears to be a necessary parallel condition to the content of instruction. Partnerships for STEM education at Metro begin with this community of students, teachers, parents, and administrators who engage the foundational curricula developed by educational and industry leaders, and are supported by the resources organized and shared by public, industry, and higher education leaders. This convergence of business and industry leaders, public officials, and university educators who contribute essential guidance and resources based on knowledge not only enhances global competitiveness and local growth, but it provides a model for high school in general. Indeed, while the Metro STEM learning experience is in the process of being introduced to other Columbus area schools as a model of a specific pedagogical approach, the network that created and maintains Metro also must be advanced as an important component of Metro success.

Several lessons can be learned from the Metro STEM experiment:

1. The small school model is not the only STEM approach, but it enhances student pacing (particularly toward mastery) and learning *in* the community and building *of* community.
2. Curricular design at Metro proves to be interactive with external participants from education, industry, government, and non-government organizations. While not an absolutely necessary condition, sufficiency in curricular design and instructional delivery is built by strengthening Metro's STEM school ties to a higher education institution, that is, OSU.
3. The Metro students' sense of relevance and learning are reinforced by the interaction between classroom and non-classroom experiences. The Metro community, including the extracurricular clubs and activities, builds long term interest in science, engineering, and related fields.
4. STEM success at Metro is built by turning weak ties, particularly with industry and applied science organizations in the community, into stronger ones.
5. Metro's governance is highly interactive, with constructive feedback between administrators, advisory groups, its steering board, and its official governing body.
6. The Metro community of students, parents, teachers, and administrators are ultimately the carriers of the STEM concept as they jointly undertake the routines of the school curriculum and activities.

5.6.3. Metro's Contribution to Personal and Professional Growth.

Several individuals identified the Metro network's contribution to their personal learning curve in one way or another. The experience increased their "collaborative capacity" (Bardach 1998). Others related to the Metro experience in terms of building communication capacities, listening skills, connectivity in working relationships, and patience in joint problem exploration and solutions. Implicit in many observations was the growth quotient in trans-disciplinary practice, as engineers, biologists, physicists, teachers, school administrators, and others were at the same table working on the same problems.

On a pedagogy-related level, the Metro builders appreciated being connected with a project that provided an opportunity for young people to not only learn STEM subjects, but also to be part of education opportunities that stretch student abilities. To a number of educators and some industry people, it was also a personal opportunity to put theory into practice.

To the home organization, partners like OSU colleges and Battelle, and learning sites like Wexner, PAST, and SWACO, working with Metro helps accomplish their core missions or a part of their purpose. It allows these community leaders to have an impact on the education of young people, particularly in science. It also affords them the opportunity to be involved in an important policy experiment in education.

5.7 Implications for Network Theory and Metro

There has been a multitude of recent research on public management networks that seems to raise as many new questions as it answers current ones. The Metro research is no different. The research reported here provides the first empirical application of the model proposed by Agranoff and McGuire (2001) that isolates four distinct sets of behaviors or phases of network management, but it does suggest new concerns. Using a grounded-theory methodology and supplemented by quantitative social network analysis, it appears from the previous discussion that the four phases are indeed evident and being practiced at Metro. As hypothesized by McGuire (2002), management through these four behaviors is recursive rather than linear. That is, activation and framing did not stop after Metro was created, mobilization did not end with going public and garnering champions to the cause, and synthesizing is an ongoing struggle to keep ideas and practices fluid and information exchanged openly. This section offers (a) an assessment of this approach to network management; (b) discusses the implications for network theory and Metro and (c) applies the findings of the quantitative analysis to Metro's current status.

How is the Metro network managed? The data demonstrate that the principle of "soft guidance" by the multiple focal nodes is an accurate description of the way decisions are made and actions are taken (Windhoff-Hentier 1992). Such guidance is the network equivalent to direct supervision in hierarchical organizations. The most central participants—the Metro principal and the CEO of the Ed Council—apparently are significant for information flow and planning, but they do not dominate the operations of the network. As depicted in the network figures and the data in Tables 5-1 through 5-3, the principal is indeed the center of the Metro universe, but there is substantial evidence from previous network research that suggests a focal "hub" or hubs can be critical to network success (Meier and O'Toole 2003). Although the classical approach views networks as being flat, self-organizing, completely interdependent entities, we have found that, in practice, a network center is not uncommon. Case studies of community mental health networks, for example, demonstrate that the effectiveness of the networks was based in part on the extent to which the network was coordinated centrally through a core agency (Provan and Milward 1995). At Metro, the principal appears to be that hub, although other nodes have been, and remain, indispensable to Metro's operation.

One issue in network theory is how a network grows and evolves (Human and Provan 2000). Maintaining the legitimacy of the Metro network as a recognizable identity, particularly to outsiders, is one mechanism for growth and acceptance. Building legitimacy also means that internal network participants find value in their membership and continue to provide resources and support. The discussions make clear that a great deal of collaborative capacity has been built among the central participants, but the social network analyses and the interviews with teachers and parents reveal a marked gap in the degree of connectivity with the Learning Partners. Metro must find a way for these potentially influential entities to become viable participants in the information sharing and planning. This will remain a critical component of Metro's growth and adaptation.

The Metro network was built piece by piece, not as an externally-created, finely-tuned machine that was completely ready to operate from the outset. Just as it did during its formation, the Metro network meets

its challenges as they emerge, almost on a case-by-case, one-by-one basis. For example, it had no four-year high school graduation template for two years, but took on each issue as it needed to be faced. Physical education was not addressed until almost the third year. Algebra II was taught before Algebra I in the first year because of a need to link students with projects. Social studies teachers were added only in the second year. Metro has operated without a uniform discipline code, but relies on the codes of the student's home districts. As needs arise, plans follow to meet a particular need. This non-linear mode appears to be essential in network management.

A succession sequence of problem emergence/problem delay/problem solution at Metro demonstrates how networks need to anticipate challenges but often delay solving them until they have put together the multiple agreements and resources required for earlier, more pressing concerns. The space issue at Metro is an example. Metro first had to find a space, with the prime cooperation of Battelle and OSU. When the students arrived, Metro had to find learning sites outside of the school. Now that the first class is about to enter OSU, there is the new space issue of where classes will be held besides at OSU. Like many other networks, small and large problems are solved as they need to be faced, not when they are uncovered (Agranoff 2007).

The Metro networked school structure is very much a post-modern type of organized entity, in many ways following a *new science* or quantum approach as opposed to a Newtonian approach. Many modern organizations are Newtonian, in that they are *boundaried* entities that grew to legitimacy as *bureaucracies* under legal authority, with divisional structures, rules, responsibilities, and so on. These organizations are Newtonian not only in the machine imagery sense, but also in a materialistic sense, with a focus on that which can be known through our physical senses. In the same way that scientists sought *building blocks* of matter, organizations were explained by their components, such as functions, staff, standards, and personnel.

The new science, by contrast, focuses on *holism* rather than parts, where systems are complete and attention is on relationship-building, bringing on a whole new set of connections that cannot be easily reduced or explained by studying the parts in isolation. For example, the quantum mechanical view startles us out of common realities, where

> *...relationship is the key determination of everything. Subatomic particles come into form and are observed only as they are in relationship to something else. They do not exist as independent 'things.' There are no basic 'building blocks' (Wheatley 2006, 11).*

In a similar quantum mode, postmodern organized entities can be seen as potentially boundary-less, making relational adjustments to their systemic needs, and as highly *un-machinelike* as they face strategic challenges in a very non-conventional way. This is clearly the way to understand the network relationships that built and sustain Metro school.

Metro is inherently conductive in structure, operations, and personnel. Saint-Onge and Armstrong (2004) define the conductive organization as: "An organization that continuously generates and renews the capabilities to achieve breakthrough performance by enhancing the quality and flow of knowledge and by calibrating its strategy, culture, structure and systems to the needs of its customers and the marketplace." (Saint-Onge and Armstrong 2004, 213). Conductivity addresses numerous organizational processes, including the importance of creating partnerships through internal-external interaction, building alliances and coalitions, forming and reforming teams across functions and organization boundaries, and collaborating to actively manage interdependencies.

> *The capability to effectively manage complex partnerships is growing in importance as organizations are reconfigured. Organizations are becoming more and more involved in complex value-creation networks, where the boundaries between one organization and another become blurred and functions become integrated. It's becoming a critical*

> *organizational and leadership capability to be able to create and leverage participation in network-designed and -delivered solutions* (Saint-Onge and Armstrong 2004, 191).

A network like Metro is a proven alternative to a single-organization hierarchy. Like a true hierarchy, Metro includes a governing body (Ed Council) and a governance and advisory structure (Metro Partnership Group and administrators), but it is not *divisionalized* or specialized. The network exists with overlays of students, parents, teachers, administrators, learning site representatives, and learning partners. Instead of command and control, Metro as a network features consensus-based decision models. Its participants experience role differentiation but operate with a fluid, participatory agreement-seeking orientation. Authority is in many places. Theoretically, this makes a network very different from a classic hierarchy.

It is even difficult to label or identify Metro as an *organization*. It is an organized undertaking that has unusual public agency standing. Metro was initially made possible by the dedicated energies of key community leaders, particularly the former president of OSU and the CEO of Battelle, whose support and resource commitments moved others to support the STEM plus small school concept. Several identifiable levels now combine to constitute the Metro's network: the Educational Council, the Metro Partnership Group, KnowledgeWorks, the Metro principal, and Battelle. As the school continues operations, layers of teachers, learning site representatives, and support personnel from OSU have also become network participants. Metro's operations extend well beyond the walls and staff of the school, involving the active learning and support activities of many partner resources and the learning centers throughout the metropolitan area.

The Metro Network continues to evolve over time. Development and maintenance of Metro is through the interactive network of students, parents, teachers, school administrators, partner representatives, learning site representatives, and others. Ideas and practices are filtered into school and Ed Council administration, teacher meetings, student town hall meetings, and most important through the informal interactive dynamics of the extensive Metro network. The existence of these pieces, plus the activities of students, parents, and intermittent learning resources, makes it difficult to call Metro an organization in the modern or Newtonian sense. Legally, Metro is not even a school. It is a networked entity.

The next section of this report provides Conclusions and Recommendations based upon study findings and is intended to provide a highlight of key issues identified through ethnographic research.

6.0 CONCLUSIONS AND RECOMMENDATIONS FOR GENERAL STEM POLICY

The issues identified in *Section 4: Anthropological Findings*, provide insight into Metro High School's community of teachers, students and parents who are engaged directly in academic endeavors offered by the Metro STEM School Program. In *Section 5: Public Network Research and Analysis*, we gain a broader perspective of the network that helped stand-up Metro, and continues to sustain it as it grows. We now turn to conclusions that build upon both the anthropology and public policy findings as well as the integration of the two studies. The combined studies define the community framework, define the significant phases of the network development, and characterize attributes of its current operation. In this process, we explore substantive issues in an integrated way that develops holistic understanding of community and network in a new light, where we gain additional insights about the Metro networked community.

The following discussion centers on two fundamental aspects of Metro. First, we draw conclusions about the way in which Metro is functioning now relative to what the designers had in mind, beginning with the core components of Metro that sustain the system as a whole and are geared to meet goals for success (Section 6.1). Second, we consider issues related to growth and development of Metro as it matures into a broader system with expanded learning partners (Section 6.2). In both sections, the issues are presented not as ranked check points for an agenda, but as core components that when optimized will provide the entire networked Metro community with a range of potential policy and network recommendations that meet diverse priorities.

6.1 An Integrated Perspective on Metro's Core Principles

The partnership process that was launched to initiate development and design of the Metro STEM School was in part shaped by a set of operating principles that allowed the partnership to engage in meaningful planning and program design processes from the earliest stages of its development. These principles were adopted from the CES program because they offered a familiar set of guidelines for action that were not only established in their effectiveness, but that also provided essential definition on roles and responsibilities for the newly formed partnership group. These included a set of rules to guide effective and respectful communication, as well as processes designed to initiate the development of trust. In similar fashion, the Metro Habits have also effectively provided a framework that instructs students and others at Metro High School on attitudes, behaviors, and approaches to learning that set expectations and define roles and responsibilities in ways that clarify what it means to be a member of the Metro community and foster development of trust.

These related sets of guiding principles are deeply rooted in the Metro network and community guiding interaction that supports planning processes, program design, curriculum development, and collaborative projects of all sorts. This accounts for the authenticity of the Metro Habits and the high expectations expressed by students and teachers alike in their aspirations to attain the ideal conduct that the Metro Habits are designed to inspire. Students also sense the genuineness of the values espoused by the Metro Habits in their demonstration by adults who are involved in Metro, from Learning Partners to OSU Faculty and Battelle staff. Social interaction is also deeply rooted in the notion of Metro as a family, providing a cultural construct in which social bonds are forged within a familiar set of expectations that are linked to establishing trust and respect inherent in the Metro Habits. For teachers, students and parents, the Metro family concept is a highly effective tool that supports a rapid approach to community building, linking the known attributes of the strength of family ties and the sense of a safe environment, to the unknown and new framework of the Metro Program.

Several important benefits derive from the existence of the Metro Habits and their function as a guide to behavior, attitudes, and goals for academic performance. First, the Metro Habits clearly provide a framework for the transition for new students and teachers to shift from the hierarchical student-teacher

relations of their home schools, to a new set of relationships characterized by self-determination, self-discipline, and respect for others regardless of status. The Metro Habits are also intended to provide a set of practices for students to emulate professional conduct. In certain ways this explicit guidance demystifies the process of attaining the type of social skills that underlie successful professional development and confidence building that also supports developing effective communication skills and self-reliance.

Modeling of these behaviors by teachers, administrators, and Learning Partners who engage with students, also reinforces the value of the Metro Habits as a code of conduct and way to earn respect and gain authority for one's abilities. Modeling these behaviors, whether by adults or students, also provides a *de facto* mentoring relationship between individuals in their engagement in academics, including the pursuit of Mastery and includes student-to-student mentoring as a fundamental aspect of mastery learning. The tacit approval of others in achievement of Mastery carries an implied understanding that practice of the Metro Habits is linked to that success.

The formation of after-school clubs also demonstrates student initiative in developing socially organized, extra-curricular activities conducive to the Metro Program. The clubs provide an informal atmosphere where students, teachers, parents and Learning Partners can explore mutual interests beyond classroom instruction. Clubs function by the rules of the school and the Metro Habits that guide social interaction. Parents and teachers interviewed agreed that the after-school clubs provide an essential component of the Program that serves critical needs for student social development. However without increased parent and Learning Partners involvement the burden of the club sponsorship falls to the teacher whose time is already stretched thin. The after-school clubs also provide the opportunity to build social relationships between teachers, parents and Learning Partners in ways that contribute to strengthening ties among the extended Metro community, and offer the possibility of enhancing communication and understanding among the different perspectives and goals for the Metro High School Program.

Another important characteristic of the network partnership, which is also true of the school community, was the development of a "willingness to try" culture among the network participants. This cultural feature developed among the network participants and remains an essential aspect of a commitment to success. This was also reflected in the approach to Metro High School's long-term planning which was characterized as "backward mapping" where decisions on the design of the program were based upon the critical program requirements of the first graduating class five years in the future. This outcomes-based approach assumed success and provided a strategy that would assure that the program could effectively meet clear cut goals and objectives, in this instance, the criteria for graduation.

This "willingness to try" and outcomes-based approach adopted initially by the network is also an essential aspect of the school community. Among the study respondents, there are those who express expectations of success and who act in accordance with those expectations. Anticipating success as the outcome allows individuals to commit to the unknown, and to have confidence that they will navigate their way through a series of steps as yet undefined, expecting that they will meet the standards for Mastery, and that they will engage in project development, earn internships, and gain early college entrance. However, with two years remaining in Metro High School program development, the unknowns for students and teachers has created a sense of uncertainty about achieving Mastery.[1]

While the two studies provide a ground-truthing for one another, they also provide a clearer image of areas of divergence that might not have been immediately apparent in a single-focus research study. These

[1] As of publication of this study 34% of the students who began Year 1 have successfully attained *Gateway* into early college exceeding the expected 25% target. The success of these students has had a marked affect on the remaining Year 1 students, who report that they anticipate achieving *Gateway* at the conclusion of the first trimester.

divergences help direct further research questions and potential solutions for dealing with problems that arise as the Metro networked community continues to mature.

For example, those who say they see Metro High School evolving toward meeting expectations and say they share a willingness to work together, are in some cases also concerned about the effort and commitment this requires. In addition, there are those who do not feel the same confidence that Metro can meet expectations, and who do not see a strategy they can commit to, but instead feel that there is too much expected and not enough time for what is needed. The Metro Partnership Group addressed these same issues of commitment and time during the early stages of the network's development. The process of allowing partners to engage or disengage was accomplished through self-selection of those willing to commit. In this way, those entities that chose to engage were able to participate and provide an essential resource, while those that could not were able to end their involvement with no further expectations from the group.

Engendering similar strategies between the network and the Metro school community, conveying this dimension of the network's core principles, would help those at the community level of the Metro network who sense a link between lack of commitment to Metro and concerns about the effect of this on the fabric of the Metro community. There needs to be a consideration for developing a viable strategy for those who are not able or willing to commit to the Metro Program once enrolled. This will be discussed in more detail later in this section.

The profound sense of the success of Metro has nonetheless pervaded the student body itself, Learning Partners, the greater Columbus City community, and others in the state and across the country who have come to visit Metro. Just as with the network group, teachers, students, and parents also express a value for the caliber of the Metro partners. They recognize the importance of maintaining an extended community of powerful institutions that include OSU, Battelle, and other Learning Partners who will increasingly take on more direct engagement with students as the third and fourth year of the program occurs. The involvement of these powerful and influential partners from the inception of the Metro partnership signaled to all potential participants that there was a real possibility for success, providing real incentives to get engaged beyond simply supplying material resources to commit to the effort.

This same sense and expectation of success extends to the Metro STEM School community, instilling a real sense of pride in the expectation of success and the assumption that each individual will be part of that success. This also contributes to the 'spotlight effect' that accrues from the constant stream of visitors and others who come to observe the Metro Program. This constant observation offers multiple levels of feedback for the Metro community that include media and other means of reporting on the school, providing first hand accounts on what visitors see at Metro, as well as what they believe to be true about the success of Metro. The level and quality of the feedback (e.g., published newspaper accounts, reporting on national radio, etc.) is no small feature in the day-to-day life of the school and should be considered as another dimension of the way in which the school has been nurtured from inception through the early stages of implementation reinforcing a sense of importance about the future of Metro High School.

In the section that follows, issues are considered that concern aspects of Metro's future growth and potential resources and capacities for meeting new challenges and sustaining strategies at all levels of the Metro networked community.

6.2 An Integrated Perspective on Metro's Future Growth

As the Metro STEM School grows over the next two years, there are obvious changes that are anticipated and planned for as part of the expansion of the program that will include 100 new freshmen in each of the next two years. The Metro Network partners also recognize the inevitable need to grow the partnership, with special focus on expanding the number of Learning Partners as the program matures and internships become

more of a focus for senior students. These changes are actively being pursued, merging the network and the Metro community, where teachers and parents signaled that they are turning their attention to building links with existing Learning Partners, as well as recruiting new partners in the greater Columbus City community.

The role that teachers and parents will play as the network expands is not well defined, yet there are expectations on the part of the teachers that this is an area where they need to be involved more directly as their students advance to internships and become more engaged in the required Service Learning Projects. Parents also feel they have something to contribute and anticipate that they will have the opportunity to become engaged in the process of recruiting new Learning Partners. From the network partnership perspective, the importance of establishing a role for the parents was voiced early on by the STEM School designers, recognizing that parents as well as teachers would play a critical role in establishing new links to Learning Partners, as well as in maintaining links to existing Learning Partners.

One critical finding identified in the network study concerns the Learning Partners and their apparent lack of connection to the Metro Network. Assuming that there are a number of remedies that can be implemented to strengthen ties with the Learning Partners, one key step would be in explicitly providing a mechanism for teachers to play a greater role in developing and maintaining Learning Partner links. This would serve multiple goals both from the perspective of the network participants, as well as from the perspective of teachers and students. For the network, involving the teachers more directly with the Learning Partners would allow network participants to focus more of their efforts on growing the network. For teachers, this would shift the emphasis of the relationship of the Learning Partner from the overall network and school, to the classroom level where teachers are ultimately responsible for guiding student development of internships and Service Learning Projects in collaboration with Learning Partners.

The network study also defines the Metro teachers as a subset of the network, where communication is primarily focused on interaction among the teachers. From the community study, we know that teachers recognize their limited connections outside the school, and express a desire to increase their ability to link directly with community resources and with Learning Partners in order to enhance the applied learning components of student coursework. Recognizing the untapped role that teachers can play in this regard should lead to changes that will strengthen the network and the school community, as well as the Program.

Obstacles to parent involvement are more complex and point back to the importance of strengthening community-level communication, a feature of the network that has been effectively achieved since its inception as represented in the views of the network participants. The importance of improving communication within the Metro community is a top priority that parents in particular say is improving, as do teachers. The priority for better communication on a daily basis within the Metro STEM School community may actually lead the way in supporting the network as it expands, especially given the potential for maximizing the Internet capabilities that potentially meet these needs. Parents are also leading an effort recently establishing the Parent Teacher Student Organization (PTSO), in order to initiate a role in which they can creatively and effectively support the school, including playing a greater role as school "ambassadors" advocating for community interest and support.

Improving and maintaining good communication, from the standpoint of the experience of the network, will also enhance confidence and commitment to the program across all groups, which is essential to building trust. The importance of staying in the loop in a highly dynamic environment like Metro is also noted by students, parents, and teachers alike who feel their opportunities to engage more fully are being hampered by lack of good communication.

One interesting finding among the network participants was the personal benefit that individual network participants identified as part of their experience in working on the Metro STEM School project. We note that these benefits included increased collaborative skills, opportunities to build communication capacities as

well as listening skills, improving connectivity in working relationships, and developing patience in joint problem solving. Additionally, network participants also cited the opportunity to gain a trans-disciplinary growth quotient, as engineers, biologists, physicists, teachers, school administrators and others were at the same table working together on the same problems. An important motivation articulated by Metro teachers also points to an expectation that Metro would provide professional growth and development opportunities gained from their involvement in a STEM education program. Placing greater emphasis on identifying ways to build upon what the network has achieved in this regard can provide a foundation for teachers in ways that will benefit the school's quality of instruction, as well as meet the personal expectations held by those teachers who cited professional development as a reason for joining Metro.

Effective participation in the Metro Network is a goal that is shared across all groups and among the different levels of network operations. The network study provided an understanding of the way in which the network partners worked together, pressing for accountability among the partners at every step, but also allowing for flexibility in recognizing that not everyone is suited to work in the context of a highly flexible, outcomes-driven process. As the Metro Partnership project moved forward, those who engaged were at the table by choice. In similar ways, the Metro School Program is also viewed as a school of choice, where teachers and students have voluntarily entered the STEM program as an alternative to their home high school. There is concern on the part of students and parents, as well as teachers, that there has been no obvious mechanism developed that could give individual students a chance to opt out of the program. This is a problem that some anticipate will arise in the program's third year as Mastery requirements confront third year students who should be advancing to early college coursework.

Can the network experience help with finding an approach to meeting this inevitable hurdle, providing a viable process for students to reevaluate their satisfaction with the Program and capacity to meet Mastery requirements, and perhaps choose to opt out in favor of their home high school and the traditional path to graduation? If this issue is addressed in the same manner that the network allowed for choice to determine continued engagement, then the mechanism that could be developed would be one that avoids the sense of failure on the part of the student, their teachers, and the school as a whole. Rather, it could provide for a series of options that are designed to give students and parents a productive and realistic set of options and steps to move forward to graduation through the traditional high school program without the stigma of failing Mastery.

A final point to consider with regard to Mastery concerns the fears held by some parents, teachers, and others who say that they are not sure that Metro can achieve an effective Mastery program in the long run. In part this stems from the pressure to perform in an accelerated pace with components of the program yet to be defined. These fears also seem to derive from the fact that teachers are designing classroom coursework concurrently with teaching their core subjects. With two years of effort in building the curriculum that supports the courses offered, confidence is growing, yet fears still persist that there will not be enough time to make it work. Turning to the network participants to understand the process by which Mastery was originally identified and embraced by the program designers, we know that much of what was decided was based on first-hand observation of other programs and communication with other STEM schools. In this process, the network partners availed themselves of what had already been accomplished around the country, looking closely at other STEM schools to study the resources, structure, operations, and outcomes, selecting what they thought was the best fit for Ohio's first STEM-based program.

In like fashion, this approach should continue linking Metro with other Mastery-based schools, allowing the whole community to gain more information about successful Mastery programs. Considering that there are schools where Mastery has evolved over several years, and where there is a track record that can be mined, Metro can easily benefit from considering the best techniques that have been developed, as well as consider what does not work. In opening these links, teachers and students will also benefit from direct communication with other programs, and in this way also begin to fill in the *unknown* dimension of Mastery.

This will also provide a sense of confidence and inspire new and innovative thinking, which is the keystone of Metro's strength.

In the following section, we provide a summary of key findings that reiterate the importance of the community and its links to the network partnership framework, the importance of how reflective the school community is of the overall network, and the importance of the organic nature of Metro as a networked community. The recommendations follow from the issues that have been discussed in this report and are intended to assist in the further optimization of the Metro STEM Network.

- **The Metro High School community is a microcosm of the network**. The school community should be viewed as possessing the same capacities and potentialities as the network, (*i.e.*, there is a network within the school, they have agreed upon principles of interaction, they are able to identify obstacles and/or constraints, they do address problems in both formal and informal ways) for example, Town Hall Meetings, issue-oriented dialogue (Socratic Discussion). The experience of the network should both inform the school community on effective practices, as well as inspire support for the evolution of innovative strategies that meet specific needs of the school itself.

- **Partners are essential**. STEM education requires school engagement with other entities, particularly higher education and industry. Metro chose a network as the form of organizing to bring in those partners. The network offered the flexibility to include a variety of information and resources, particularly higher education, knowledge-based industry, and learning sites in the community. These collaborative links are essential to STEM education.

- **Learning resources are found in the community**. The Metro partners played a critical role in the founding of Metro and continue to maintain its operation, but collaboration for STEM education requires relevant linkages with many different learning resources in the community. These linkages must include research laboratories and sites, classes at other educational institutions, libraries, museums, field experiences, internships, demonstrations, educational clubs, summer programs, and the like. These connections facilitate relevant learning and add to the idea of Mastery.

- **Expand the role of teachers and parents**. Just as the Metro Partnership Group is constantly looking for new Learning Partners, now, after two years, the students, teachers, and parents are voicing a desire to take the initiative in seeking new Learning Partners – they see the responsibility they have to construct the extended links into the community, both to share the benefits of the Metro Program with the surrounding greater Columbus community, and also to link into needed partnerships and resources that will provide meaningful, applied learning opportunities of mutual benefit to both Metro and to Learning Partners.

- **Articulation**. The resource links are buttressed by those who understand that the "devil can be in the details." Metro staff plus the Ed Council have made the STEM Metro model work by paying attention to such important details as graduation requirements, learning outcomes, pedagogical methods, individual pacing, academic assistance, financing flows, and the like. Given the Metro network model, these details require constant articulation across organizational boundaries and consideration of the balance among competing interests.

- **Continuous feedback nourishes the network and the school community**. Metro's successes to date have been supported by continuous feedback regarding its structure, operations, achievements, and culture, especially input from key partner representatives; learning site coordinators, consultant and coaches, as well as its administrators and teachers. The importance of visitors and school tours offered to both local Columbus community members, as well as to others in the state and across the country, increases the "spotlight effect" and sense that Metro is an example of something new and

important in education reform. Indeed, this study is part of that feedback process. An entity like Metro must maintain this capacity to know, learn, modify, and grow.

- **Other policy resources are necessary**. Establishment of a governance framework by partners is a developmental step that needs to be bridged into implementation. The connections built for activating STEM education require constant infrastructure maintenance. Metro's initial successes are in great measure because of the continuing interest by partners and learning resource representatives who have done more than provide "up front" money, but have continuously contributed resources, financial and otherwise, dedicated to sustaining Metro. Metro has also invested in key personnel to maintain collaborative, curricular, and learning-site connections.

- **Governance should be "conductive."** The model that primarily organizes the STEM effort does not have to be a network like Metro. Alternatively, it could be a (state) charter school, a special unit of local government, a dedicated school within a school district, or some other model. However, whichever model is adopted, to be conductive it must have open boundaries and exercise a high degree of connectivity to build working relationships with partners and learning resources.

6.3 Recommendations for Metro High School and the Metro Network

The following recommendations are presented in brief form and refer back to the discussion in this section. These are offered from a perspective of possible short-term actions to meet specific needs, with an understanding that ultimately these suggestions may need time and further organizational considerations to implement long term results. All recommendations are offered as food for thought and are supported by the issues identified in this study.

- *Address issues regarding time management, especially lack of time*: Ongoing or revisited time management training should be available for students and for teachers to provide a new set of resources and tools to adjust to the accelerated pace of the Metro Program.

- *Address challenges relating to the fear of meeting Mastery objectives*: Create linkages for students and teachers with other schools that have successfully graduated students under a Mastery system; these could be conducted via a Skype™ discussion or teleconference to share lessons learned, goals, and resources identified to support program needs.

- *Build new links between Metro and existing and new Learning Partners*: Dedicate a structured time for interdisciplinary professional development that links outside learning partners to teachers, e.g., interdisciplinary meetings, as well as site visits and other ways in which teachers can better prepare for collaborative projects and applied learning opportunities.

- *Create a distinct set of expectations for Metro teachers that convey their unique role*: There should be a paradigm shift for the Metro community in viewing the instructional staff as "faculty" rather than a "group of teachers." This would recognize the high expectations that the Metro instructors are part of the Metro Program comprised of faculty who are engaged in research and curriculum development, as well as conducting classroom instruction. The importance of this shift in perception could also satisfy teacher's desires to gain in their professional standing as a benefit of their commitment and involvement in Metro. This can be accomplished through any one of various types of faculty appointments at OSU or other colleges and universities.

- *Address the lack of opportunity for teachers to meet required curriculum and program development*: The Metro instructors should be allocated structured time within the prescribed school schedule to develop curriculum and program-based learning similar to processes used by university faculty. This

would eliminate the need for teachers to scramble to find this time, coordinate among themselves, and otherwise marginalize this critical component of the Metro STEM learning system. This could be achieved in the form of committing a block of time during the school day on a weekly basis for teachers to focus on collaborative project development, teacher planning sessions, or curriculum development. This would eliminate the constraints on teachers to find adequate time to conduct this work before and after school. Providing a structured time for teachers to engage in collaborative work would also contribute to development of improved social relations among the teachers who express a desire to strengthen working relations among their peers.

- *Increase student involvement in out-of-classroom, field-based learning opportunities*: Expand the Learning Partners program-based learning opportunities for first and second year students by increasing these opportunities before the students reach their third year of the program. Teachers expressed the view that these experiences are invaluable for students who are shifting from the traditional high school model of learning to Mastery, where self-initiated learning must be inculcated in student behavior.

- *Formalize the after-school clubs*: Provide the framework for club formation, and support for clubs once formed. This will ensure that clubs continue to provide an opportunity for student social development with guidance from teachers, parents, and Learning Partners. Additional benefits through involvement of parents and Learning Partners will also accrue from the informal social setting of clubs and may provide an essential opportunity to strengthen the extended Metro community. Teacher involvement must be recognized as an essential component of clubs. Clubs should be a part of the school program but should not conflict or interfere with scheduled teacher curriculum preparation.

- *Improve communication to those outside Metro High School, including Parents and Learning Partners*: Involve students and parents in creating new systems and opportunities for expanding and improving communication, including working with the PTSO. This will be perceived as an effort to increase the opportunities to engage in Metro – one of the explicit points made by interview respondents.

- *Extend the involvement of learning-site representatives into the network*: Establish clear modes of involvement for potential Learning Partners to engage with Metro, bringing them to Metro to learn about the core of the school programs, and to explore ways in which they can work collaboratively with Metro teachers and staff.

- *Consistently and continually communicate with the education community, both K-12 and post-secondary, about curricular matters*: Involve industry knowledge leaders in this undertaking by bringing them into curricular design. Take into account any current involvement that may be occurring through the OSU link to Metro and expand on those relationships.

- *Encourage the dissemination of STEM learning approaches from Metro to the 16 School Districts*: This effort is an invaluable tool for continued recruitment and student preparation for the STEM learning experience. In this respect, the efforts of the PAST Foundation require essential support. Validating the legitimacy of STEM is an ongoing process for the Metro networked community. Programs piloted at Metro should be shared with other public school venues. It is one of the fastest and most cost-effective ways to promote STEM and accelerate the dissemination of this type of educational reform. Programs, like the summer field studies that were mentioned repeatedly by students and teachers, help prepare the students for the shift into STEM learning, and help students already in the STEM program successfully apply their newly gained knowledge and skills in authentic situations.

- *Implement an internal formal audit/assessment for The Metro Partnership Group*: The MPG would benefit from an evaluation to gauge where Metro has succeeded, and where it should be direct future efforts. Performance feedback is as necessary in networks as it is in organizations.

- *Establish a partnership event or format modeled after the group and processes that occurred in Tacoma*: *Using* this report, as well as other information, network members could create a baseline for a Metro Partnership Group "Tacoma-2," using a retreat format that would review all recommendations and establish future guidance processes and policies.

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8.0 APPENDICES

A. Consent to Participate Form for Research

B. Teacher Key Informant Questionnaire

C. Student Key Informant Questionnaire

D. Parent Key Informant Questionnaire

E. Student Input to Construction of General Student Questionnaire

F. Student Questionnaire

G. Mapping Metro Project

H. Metro Network Study Discussion Guide

I. Metro School Network Survey Questionnaire

J. Policy Research Design

PAST Foundation Consent to Participate in Research

Study Title:	Emerging STEM School Community and Public Network Management (Metro: An Emerging School Community)
Researchers:	PI: Monica S. Hunter, Ph.D., PAST Foundation PI: Robert Agranoff, Ph.D., Indiana University Co-PI: Jill Greenbaum, Ph.D., PAST Foundation Co-PI: Michael McGuire, Ph.D., Indiana University Co-PI: Jan Morrison, MA, TIES Maria Cohen, MA, PAST Foundation Jing Liu, MA, Battelle Center for Mathematics and Science Education Policy, John Glenn School of Public Affairs, The Ohio State University
Research Organization:	PAST Foundation, Columbus, Ohio

This is a consent form for research participation. It contains important information about this study and what to expect if you decide to participate.

Your participation is voluntary.

Please consider the information carefully. Feel free to ask questions before making your decision whether or not to participate. If you decide to participate, you will be asked to sign this form and will receive a copy of the form.

Purpose:

The study is intended to provide an understanding of the development of a STEM school community during its first and second year of formation. Metro High School, which began enrolling students in Fall 2006, provides an excellent opportunity to conduct research which will document and analyze key factors associated with the school's community development and public networks management regarding STEM education in a state that has actively opted to pursue STEM education. This project will combine the expertise of a team of anthropological ethnographers, policy analysts and educators to insure that variable components of the study are included. The information generated by this study will inform all future STEM community studies and will help identify key factors associated with academic excellence, as well as critical information for policy makers and educators engaged in creating new STEM based educational opportunities.

Procedures/Tasks:

The study will involve several methods to gain information about Metro High School, including one-on-one interviews, group discussions, and observations of school activities.

Project Team members conducting interviews, group discussions or observations will record hand-written notes only. Access to study documents will be limited to the Project Team. The information gathered for this study will not be utilized for any purpose other than to contribute to the completion of the research project.

Duration:

The study will be conducted from January to June 2008. If you agree to participate in the study, you may leave the study at any time. If you decide to stop participating in the study, there will be no penalty to you, and you will not lose any benefits to which you are otherwise entitled. Your decision will not affect your future relationship with the PAST Foundation or any organization involved with the study.

Risks and Benefits:

You will not benefit directly from participating in the study.
There are no risks associated with participation in this study.

Confidentiality:

All study records will be maintained by the Project Team in a secure location, and access to project files will be strictly limited to the Project Team. All information provided to the Project Team will remain anonymous and will not carry identifying information including the names of individuals participating in the study. Following completion of the study, all hard copies of project records will be destroyed. A single copy of all project materials will be maintained in electronic format by the PAST Foundation, and will only be utilized for future studies relating to STEM Program schools or other research of educational programs and processes.

Efforts will be made to keep your study-related information confidential. However, there may be circumstances where this information must be released. For example, personal information regarding your participation in this study may be disclosed if required by *state law or federal law*.

Incentives:

You will not be compensated in anyway to participate in the study.

Participant Rights:

You may refuse to participate in this study without penalty or loss of benefits to which you are otherwise entitled. If you are a student or employee at the PAST Foundation or at the Metro High School, your decision will not affect your grades or employment status.

If you choose to participate in the study, you may discontinue participation at any time without penalty or loss of benefits. By signing this form, you do not give up any personal legal rights you may have as a participant in this study.

An Institutional Review Board responsible for human subjects research at The PAST Foundation reviewed this research project and found it to be acceptable, according to applicable state and federal regulations and PAST's policies designed to protect the rights and welfare of participants in research.

Contacts and Questions:
For questions, concerns, or complaints about the study you may contact **the PAST Foundation at 614-432-8585 where you can leave a message and the appropriate person will return your call and address your concerns**.

Signing the consent form

I have read (or someone has read to me) this form and I am aware that I am being asked to participate in a research study. I have had the opportunity to ask questions and have had them answered to my satisfaction. I voluntarily agree to participate in this study.

I am not giving up any legal rights by signing this form. I will be given a copy of this form**.**

Printed name of subject	**Signature of subject**
	AM/PM
	Date and time
Printed name of person authorized to consent for subject (when applicable)	**Signature of person authorized to consent for subject (when applicable)**
	AM/PM
Relationship to the subject	**Date and time**

Investigator/Research Staff

I have explained the research to the participant or his/her representative before requesting the signature(s) above. There are no blanks in this document. A copy of this form has been given to the participant or his/her representative.

Printed name of person obtaining consent	**Signature of person obtaining consent**
	AM/PM
	Date and time

Appendix B: Teacher Interview Questions

1. When did you start at Metro High School?
2. Is this your first teaching experience?
    - Where else have you taught?
3. Why did you volunteer to come to Metro to teach?
4. How many subjects do you teach?
5. How many classes do you teach?
    - Do you have assistance in the classroom?
    - How so?
6. What other involvement do you have with students?
7. Do you work together with other teachers?
    - How so?
8. What was your idea of Metro before you came here to teach?
9. What is your idea of Metro now?
10. How do you describe the concept of community at Metro?
11. How would you describe the Metro community at this time?
12. What is your role in community building at Metro?
13. What is the role of students in community building at Metro?
14. In your view are there others that contribute to community building at Metro?
15. What are the strongest aspects of the community at Metro for you?
    - What were the strongest aspects at your last school?
16. What are the weakest aspects of the community at Metro for you?
    - What were the weakest aspects at your last school?
17. What is your strongest connection in terms of relationships within the Metro community?
18. How would you describe collaboration as a concept at Metro?
19. A) Second Year Teachers:
    - Would you say that collaboration has changed between year one and year two?

    B) First Year Teachers:
    - Are there collaborations between year one teachers and year two teachers?
20. What do you think of the development of clubs, dances, sports or other extra curricular activities at Metro?

Appendix C: Student Interview Questions

1. When did you start at Metro?
2. What courses are you currently taking?
3. How many Metro credits have you obtained?
4. How do you feel about your progress?
5. How does Metro help you obtain credits?
6. Are you involved in any clubs, social activities or other extracurricular activities?
7. What was your idea of Metro before you came here to be a student?
8. Was it your choice to come here?
9. What is your idea of Metro now?
10. What do like most about Metro?
11. What do like least about Metro?
12. What is the concept of community at Metro?
13. What is your concept of community at Metro?
14. Do you actively participate in community building at Metro?
15. Do you have friendships at Metro? What kinds of activities do you do with your friends at Metro?
16. Do you have friendships with your teachers or other adults at school?
17. Are you connected to your home high school?
18. Are your parents involved in activities at Metro?
19. Are your parents involved in activities at your home high school?
20. Were your parents involved in school activities in your previous schools?
21. Are there opportunities for your parents to be involved at Metro?
22. What opportunities have been offered to you as a Metro student?
23. What interactions have you had with professionals partnering with Metro?
24. Are there student activities or interest groups you would like to see added to Metro?

Appendix D: Parent Interview Questions

1. When did your child first start at Metro High School?
2. What were some of the reasons you chose Metro for your child?
3. What was your idea of Metro before your child enrolled?
4. What is your idea of Metro now?
5. How would you describe the Metro community?
6. How does Metro describe the "Metro community"?
7. Are you an active participant in the Metro community?
    - If so, how?
    - If not, why?
8. Do you participate in your child's home high school community?
    - If so, how?
    - If not, why?
9. Is there a role for parents in community building at Metro?
10. What is your role in the Metro community?
11. In your view are there others that contribute to community building at Metro?
12. What are the strongest aspects of the community at Metro for you?
    - What were the strongest aspects at your child's last school?
13. What are the weakest aspects of the community at Metro for you?
    - What were the weakest aspects at your child's last school?
14. Who are your strongest connections in terms of relationships within the Metro community? (elaborate)
15. What do you think of the development of clubs, dances, sports or other extra curricular activities at Metro?

Appendix E:

PROPOSED QUESTIONS FOR STUDENT QUESTIONNAIRE

Key Informant Student Responses	1	2	3	4	5	6	7	8	9	10	11	12	total
1. When did you start at M?				X									1
2. What courses are you currently taking?				X									1
3. How many Metro credits have you obtained?				X									1
4. How do you feel about your progress?			X	X		X		X		X			5
5. How does Metro help you obtain credits?			X	X					X				3
6. Are you involved in any clubs, social activities or other extracurricular activities?				X									1
7. What was your idea of M before you came here to be a student?			X	X			X		X	X		X	6
8. Was it your choice to come here?	X		X	X			X					X	5
9. What is your idea of M now?	X		X	X			X					X	5
10. What do like most about M?	X		X	X	X			X					5
11. What do like least about M?			X	X	X	X							4
12. What is the concept of community at M?		X	X	+		X							4
13. What is your concept of community at M?		X	X	+					X				3
14. Do you actively participate in community building at M?		X				X					X		3
a. Prompt: if not why													
15. Do you have friendships at M? What kinds of activities do you do with your friends at M?			X								X		2
16. Do you have friendships with your teachers or other adults at school?			X						X		X		3
a. Prompt: if yes, in what ways do those friendships add to your M experience?													
b. Prompt: if no, why not?								X					1
17. Are you connected to your home high school?										X	X		2
a. Prompt: if yes what type? Friendships, sports, social activities						X							1
b. Prompt: if no, why not?													
18. Are your parents involved in activities at M?													
a. Prompt: in what ways?													
19. Are your parents involved in activities at your home high school?													
20. Were your parents involved in school activities in your previous schools?													
21. Are there opportunities for your parents to be involved at Metro?													
22. What opportunities have been offered to you as a M student?			X		X					X			3
24. Are there student activities or interest groups you'd like to see added to Metro?										X	X		2

Appendix F: Student Questionnaire

For the past few months we've been conducting interviews with your classmates and teachers, as well as observing classes and other student activities. Ideally we would interview all 125 students who consented to participate in this study, but our time for this project is limited. However, we can give you this opportunity to express your opinions by responding to these student-selected questions.

Please help us learn more about the Metro High School community by answering the following questions as candidly and openly as possible. You will have approximately 30 minutes to complete the following questions. This questionnaire is anonymous and your responses will only be read by the PAST project team.

Please circle the appropriate answer:

1. Are you in: 9th grade 10th grade

2. Are you: Male Female

Please write at least 3-5 sentences in your answers to the following questions in the space provided below.

3. What was your idea of Metro High School before you came here to be a student?

4. Was it your decision or your family's decision for you to come to Metro? How was this choice made?

5. What is your idea of Metro High School now?

6. What do you like most about Metro High School?

7. What do you like least about Metro High School?

8. How do you feel about your progress with mastery?

9. How would you describe the purpose of Advisory, and if it adds to your Metro experience, how does it benefit you?

10. How would you describe the Metro High School community?

Appendix G: MAPPING METRO PROJECT

Metro High School, 10th Grade Math Class
Metro Lead Teacher: Lisa Floyd Jefferson
PAST Foundation Coordinators: Sheli Smith, Monica Hunter, Jing Liu

OVERVIEW

The **MAPPING METRO** Project was conducted by the Metro High School 10th Grade Math Class in collaboration with the PAST Foundation as an interactive component of the Emerging STEM School Community Study. The first phase of the project was completed during the third trimester of the 2007-2008 school year. The second phase of the project will be conducted during the 2008-2009 school year as an integrated component of the 10th Grade Math Class curriculum.

The MAPPING METRO Project was developed as a student project exercise to create a series of maps using Geographic Information System technology. The first phase of the project produced a map that illustrates the geographic linkages between Metro High School and the home schools of the Metro High student population. The second phase of the project will focus on the school facility and student activities within the common areas of the school. The maps produced in phase two of the project will provide the basis for analyzing the modular design and multiple uses of the school's learning environment.

PURPOSE OF THE PROJECT

The design of the project has two purposes:

1) Provide students with an applied math learning project and basic training in using GIS technology.
2) Provide students with an opportunity to understand their connections to the school community and the Greater Columbus Metropolitan community.

The MAPPING METRO Project has two parts: *Mapping Metro the Community* which includes identifying Metro High School student home schools, and *Mapping Metro the School,* which includes mapping the Metro High School facility.

MAPPING METRO the Community is the first component of the Project. The final project map will show the locations of the (43) home schools and (16) school districts of Metro High School students. Analysis of this information will provide a visual display of geographic distribution of students within the greater Columbus Metropolitan area. Complemented with basic demographic information, the analysis can provide the basis for assessing the geographic distribution of the student body, and inform understanding of the various types of diversity of the school population. Students will also gain a better understanding of the potential connections between the Metro School and its supporting community network of Learning Partners.

MAPPING METRO the School comprises the second component of the project. It focuses on mapping the open space (common areas) within the school facility. These areas are designed to serve multiple purposes and provide a dynamic learning and social environment throughout the course of a given school day.

MAPPING METRO the School explores two key research questions:

1) How does the organization of open space within the Metro School meet the needs of students for academic learning?
2) How does the organization of the open space within the Metro School meet the needs of students for social interaction?

This component of the MAPPING METRO Project is intended to help students explore their everyday experiences at the School through observation of the patterns of use of the various common areas within the school during a series of school days. The resulting analysis will describe ways in which the physical space meets student needs for learning, as well as ways in which students utilize the space for socializing throughout the school day. The project will contribute to student understanding of the ways in which the school functions to create a conducive learning environment. It can also serve as an important document in the recruitment information package for students and their families, and also serve as a freshman orientation tool.

PROJECT PROGRESS

The project was conducted as a math class project beginning May 5th and ending June 6th, 2008. Students conducted data collection and analysis activities guided by the Lead Teacher and PAST Foundation Staff.

MAPPING METRO the Community

Students initiated the project by researching the location of home schools and identifying those locations on a large map of the greater Columbus Metropolitan area which was displayed in the classroom. Each home school location was marked with a color coded pin. Students were then asked to measure the direct distance between Metro High School and each home school. They were also asked to research the travel distance between home schools and the Metro High School campus, and compare it to the direct distance.

MAPPING METRO the School

The PAST Foundation conducted an orientation of project protocols for the 10th grade class on project methodology for observation of the common space in the school. Protocols were developed during a two-day pilot observation and photographic exercise conducted by PAST Staff.

The Project was conducted in the following sequence of steps:

Students were divided into four working groups. Each group was assigned a fixed time slot for their observation to occur for the duration of five days. Each group observed and recorded information about the use of selected common areas including:

a. number of students using the space;
b. number of teachers present in the space;
c. number of administrative staff present in the space;
d. number of visitors present in the space;

e. primary use of the space: class, class break, lunch, tutoring, counseling, student-teacher meeting, teacher meeting, club meeting, casual socializing, special events, etc.;
f. arrangement of furniture was recorded on the following basis: *unorganized*, *semi-organized*, or *organized* on a scale of 1-3;
g. conduciveness of the space as a learning environment on a scale of 1-3; and,
h. conduciveness of the space for socializing on a scale of 1-3.

Students were also asked to record their observations with a photograph at the time of the written observation. Each group was assigned an observation point for consistency of data collection across the five-day period. The photographs were stored electronically and were reviewed as part of the analysis of data developed for the project.

In the next phase of the Project students will:

1) Organize the photographic record utilizing PowerPoint software for presentation to new students in the next school year as part of student orientation.
2) Develop all data collected for input to GIS software.
3) Data collection will be replicated by the next 10th Grade Math Class to develop a second data set for comparison between the first project and the second project phase.
4) Convert PDF files with Project data of the school floor plan into GIS-compatible format using ProE software for future analysis.
5) Collected data will be converted to an electronic copy for GIS presentation and analysis. The analysis could be conducted as a comparison of Metro High School's multiple use/modular design with traditional school settings. Students will be asked to interpret the patterns of use in specific common areas of the school to understand: the special and temporal patterns of use; the versatility of these spaces in meeting student needs; and, how these areas enhance and support the diverse needs and goals of students in a range of experiences that Metro High School provides.

Appendix H: Metro Network Study Discussion Guide Questions

1. CAN YOU BRIEFLY DESCRIBE WHAT YOUR INVOLVEMENT WITH METRO SCHOOL HAS BEEN, IN BOTH FORMATION AND OPERATION?

2. (If involved in formation. Or go to number 6.) CAN YOU PROVIDE US WITH A REVIEW OF THE MAJOR EVENTS THAT LED TO THE OPENING OF THE SCHOOL'S DOORS IN FALL 2006?

3. WHAT WAS YOUR ROLE IN THIS FORMULATION PROCESS? (Probe for initial understandings and expectations; key supports; loan of staff; expertise, other commitments.)

4. IN ENGAGING IN THESE METRO RELATED ACTIVITIES WITH WHOM DID YOU WORK MOST CLOSELY? (Probe for type or role, contact with other organizations – local-state-national-, probe for executives or staff.)

5. (For top executives only—do not ask others). HAVE YOU PLAYED A CONTINUING ROLE? IF YES, WITH WHOM? (Probe as in number 4.) (For top enablers go to number 16.)

   Note: Questions for top enablers numbers 1-5 and number 16 only. For others, if not involved in formulation (number 1) go on to question number 6.

6. HAVE YOU EVER BEEN INVOLVED IN WORKING WITH A NETWORKED ORGANIZATION LIKE METRO BEFORE? THAT IS, HAVE YOU HAD PRIOR EXPERIENCE WITH AN ENTITY THAT INVOLVES THE COOPERATION OF MULTIPLE ORGANIZATIONS?

7. (If not answered before.) AS YOU BEGAN TO WORK WITH ONE ANOTHER AS REPRESENTATIVES FROM DIFFERENT ORGANIZATIONS, HOW DID THE WORKING GROUP BEGIN TO DEVELOP MUTUAL UNDERSTANDINGS AND EXPECTATIONS?

8. AS METRO PARTNERS AND SUPPORTERS HOW DID YOU DEVELOP A SENSE OF COMMON STRATEGY AND SET MUTUAL OBJECTIVES? (Probe for involvement in strategic research and for planning and accessing school programs; team curricular planning.)

9. HOW DO THE INTERACTING ORGANIZATION REPRESENTATIVES ENCOURAGE WIDESPREAD PARTICIPATION, EXCHANGE IDEAS, AND LEARN FROM ONE ANOTHER? (Probe for building of learning communities.)

10. HOW IS TRUST AND BELIEF IN WORKING TOWARD A COMMON PURPOSE BUILT?

11. WERE YOU ABLE TO ENGAGE OTHER ORGANIZATIONS AS YOU WORKED TOGETHER? (Probe for whom and how, particularly surrounding community-based learning experiences, coaching, accessing community resources.)

12. AS A GROUP WORKING TOGETHER HOW DID YOU ARRIVE AT AGREED UPON COURSES OF ACTION? (Probe for both process and decision-making and use of incentives.)

13. AFTER AGREEMENT IS REACHED, WHO IS RESPONSIBLE FOR CARRYING OUT DECISIONS/ACTIONS? TO WHAT EXTENT DO YOU DELEGATE? HOW DOES THE GROUP ENSURE FOLLOW THROUGH?

14. WHAT WOULD YOU POINT TO AS METRO'S MOST NOTABLE ACCOMPLISHMENTS TO DATE? HOW WOULD YOU COMPARE THOSE TO THOSE OF A MORE TRADITIONAL HIGH SCHOOL? (Probe for innovative design, learning communities, student achievement, student growth potential, service learning, work study, etc.)

15. WHAT HAS THE METRO EXPERIENCE MEANT TO YOU, PERSONALLY AND PROFESSIONALLY, OR FOR YOUR ORGANIZATION? (Probe for growth quotient, contacts, learning experiences, skill enhancement, multi-stakeholder collaborative advantages, resource access.)

16. IN YOUR OPINION, IS THERE ANYTHING THAT MAKES METRO UNIQUE AS A SCIENCE, TECHNOLOGY, ENGINEERING AND MATH SCHOOL?

17. NOW, DR. HUNTER, DO YOU HAVE ANYTHING ELSE TO ASK?

THE FINAL PHASE OF THIS STUDY INVOLVES A VERY SHORT PAPER AND PENCIL QUESTIONNAIRE ON NETWORK INTERACTIONS. YOUR NAME AT THE TOP WILL ONLY BE FOR OUR RECORDS. BEFORE WE LEAVE WOULD YOU TAKE FIVE MINUTES TO FILL THIS OUT. (Hand them clipboard, paper and pencil [or pen]).

THANK YOU VERY MUCH FOR YOUR TIME AND YOUR COOPERATION. IT WILL HELP OUR STUDY IMMENSELY.

Appendix I: Metro School Network Survey

Thank you for agreeing to participate in this research study. All answers will be kept confidential and your identity will not be disclosed for any reason.

Name:_____

Organization:_____

Current Job Title:_____

1. What is your role/involvement with Metro School (check all that apply)?

_____ Formation of Metro School
_____ Metro Partnership Group
_____ Educational Council
_____ Metro Learning Partner
_____ Learning Center
_____ School employee
_____ School governance
_____ Curriculum planning and development
_____ School assessment/student achievement
_____ Field learning projects
_____ Advice and consultation
_____ Other (please specify):_____

2. One a scale of 1-10, what is your overall assessment of the Metro School thus far (10 being a total success and 1 being a total lack of success)? _____

In the table on the following page, please initially identify up to 16 people who are most important to you in terms of your involvement with the Metro School. Then respond to the statements listed below and enter them into the corresponding numbers on the next page (note: the rating scale for Number 3 is different from Numbers 4-10, which have the same rating scale).

3: I have **known this person** for:
1=Less than one year 2=1-2 years 3=2-3 years 4=3-5 years 5=More than 5 years

4: I **provide information** to this person on Metro-related topics.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

5: I turn to this person to **receive information** on Metro-related topics.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

6: I **provide financial resources** to this person for Metro-related activities.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

7: I turn to this person to **receive financial resources** for Metro-related activities.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

8: I participate in **joint Metro-related planning sessions** with this person.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

9: I participate in **Metro-related projects** with this person.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

10: I **negotiate changes in policies and operations** with this person.
0=never 1=yearly 2=quarterly 3=monthly 4=weekly 5=daily

Name	**Company/Affiliation**	3. Years known	4. Provide info	5. Receive info	6. Provide finances	7. Receive finances	8. Joint planning	9. Projects	10. Negotiation
1.									
2.									
3.									
4.									
5.									
6.									
7.									
8.									
9.									
10.									
11.									
12.									
13.									
14.									
15.									
16.									

Appendix J: Research Design Outline

Second-order Research Questions	Purpose	Data Collection Method	Data Analysis Method	Data Sources
1. What prior experience with network management did key Metro figures have? How did partners come to the network?	Network formulation	Structured discussions	Matrix summary	First and second level CEOs and administrators
2. What is the activation process like? How does the identification of participants and other resources take place?	Activation phase	Structured discussions	Event-stage flow chart, matrix	All discussants, documents, observation
3. How do the partners establish the operating principles and rules of the network, and establish network values and norms?	Framing phase	Structured discussions	Event-stage flow chart, matrix	All discussants, documents, observation
4. How do the partners mobilize support and establish legitimacy?	Mobilization phase	Structured discussions	Event-stage flow chart, matrix	All discussants, documents, observation
5. How does the network facilitate productive interaction and enhance information exchange?	Synthesizing phase	Structured discussions, questionnaire	Event-stage flow chart, matrix	All discussants, documents, observation
6. Where is power held in the Metro network? Where is the authority held?	Power "over" and power "to" analysis	Structured discussions, questionnaire	Network structure displays and narratives	All discussants and key Metro participants
7. How is trust created and how has it evolved?	Network structure	Structured discussions	Narratives	All discussants
8. Who holds key project accountabilities?	Network structure	Structured discussions	Narratives	All discussants, documents
9. How does the network arrive at agreed upon courses of action?	Network decision-making	Structured discussions	Second-order coded matrix	All discussants, observation
10. What role do	Network	Structured	Narrative or truth	All discussants,

incentives play in mobilizing commitments?	process	discussions	table	documents, observations
11. What is the flow of actors through the network? How is the flow patterned?	Social network analysis	Questionnaire	Frequencies, patterns, diagrams	Coded surveys of discussants and key Metro participants
12. How does the Metro network link with related networks? What does this mean for Metro operation?	Social network analysis	Questionnaire	Frequencies, patterns, diagrams	Coded surveys of discussants and key Metro participants