1. Identify your selected Innovative Program and the reasons for selection.

Innovative Program funding of \$250,000 is requested to hire a Primary Lead STEM Practitioner (PLSP) as a two-year, fulltime new position to work with school staff to embed STEM learning at six K-8 STEM schools. The PLSP is an important component of this innovative model to leverage what has already been invested in training and development of an internal STEM expert and will result in reduced cost and increased speed of implementing STEM education. An internal highly trained PLSP is a lower cost solution than relying on outside expertise, in a time when cost is becoming increasingly important with reduced funding for education. STEM learning can also be implemented at an accelerated rate with a fulltime PLSP as an internal STEM expert whose time is 100% dedicated to developing STEM K-8 learning. In a multiplying effect, the training and professional development facilitated by the PLST will create a cohort of LSP's in the six K-8 STEM schools that will spread STEM learning at their school and eventually to other schools in the district, the state and nationally. This grant will result in a national model for accelerated STEM K-8 learning at a lower cost.

The six District designated STEM schools are George Washington Carver, Hannah Gibbons-Nottingham, Michael R. White, Mound, Mary B. Martin and Orchard. CMSD faces some of the most significant school turnaround challenges in the state of Ohio. Unlike many districts which need to address pockets of need, CMSD faces a massive school turnaround effort with extremely limited resources. Creating STEM schools in six K-8 schools is part of the turnaround effort of implementing proven achievement initiatives. Of the six K-8 STEM schools, one is rated Continuous Improvement, two are rated Academic Watch and two are Academic Emergency. Orchard is rated Effective and has been included because STEM programs were already in place. The success of STEM education at Orchard serves as a catalyst, learning opportunity and inspiring example for the other five STEM schools.

A STEM model, informed and guided by the success of MC2 STEM High School, is already being implemented in the six schools to increase academic achievement, with assistance from the Teaching Institute for Excellence in STEM (TIES). A strategic planning process lead by TIES to embed STEM learning has identified the need for the PLST position allowing MC2 STEM High School to more efficiently coordinate the support that is provided to the K-8 STEM schools, "The ways teachers learn may be more like the ways students learn than we have previously recognized. Learning theorists and organizational theorists are teaching us that people learn best through active involvement and through thinking about and becoming articulate about what they have learned." (1) The schools are receptive to the current professional development provided, as evidenced in a TIES Readiness and Capacity Survey and feedback from monthly professional development meetings, but are not always able to take the learning back to their building because they lack the consistent support to carry out the work on their own. Currently, STEM knowledge and promising practices are spread by Head of School, Jeff McClellan and the Lead STEM Practitioners (LSP's) at MC2 STEM High School to the K-8 STEM schools. The Head of School and LSP's will continue to provide support to the K-8 STEM schools as they do now, but the development of the PLSP position will

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allow the support to be continuous at the building level between regular professional development sessions. Success will be achieved when each of the K-8 STEM Schools joins MC2 STEM High School, Max Hayes Technical School and John Hay School of Science and Medicine as STEM platform schools who not only ensure STEM teaching and learning at a level of demonstrated mastery but help to inform the remainder of CMD K-8 schools what great STEM teaching and learning looks like while at the same time enabling them to achieve it. Although not all CMSD schools will be STEM schools, all will deliver project based STEM learning for mastery as they respond to the Academic Transformation Plan's challenge for excellence.

Identified as the ideal candidate for PLSP is Nick DiGiorgio, an experienced and brilliant educator who is currently Assistant Head of School at MC2STEM High School. He brings a breadth of experiences in both educational pedagogy and STEM content and is advanced in STEM, art, design and fabrication. The PLSP will develop curriculum, instructional resources and Professional Development Institutes (PDI's) that will be a purposeful, structured and continuous process that occurs over time. With a thorough understanding of the planning approach, the PLSP will keep consistency at all sites. The position would be supervised by MC2 STEM Head of School. (Resumes attached.)

This grant supports the concept of MC2 STEM High School as an incubator advancing STEM education in the region. The successes of MC2 STEM High School are informing and driving curricula and instruction at the six K-8 STEM schools. As an incubator, MC2 STEM High School provides an understanding of what works in STEM education and why. It fuels the development of infrastructures designed to capture this learning and key metrics, analyze with a value-added lens and push the new learning to the K-8 STEM schools. MC2 STEM High School is actively engaged in a National Science Foundation Research and Evaluation on Education in Science and Engineering Grant with OSLN and the University of Chicago focused on the efficacy of network behavior and its value to dissemination of practice throughout urban districts. MC2 STEM HS is an exemplar in this study.

MC2 STEM High School is a project-based school embedded in the STEM community currently serving grades 9-11. At MC2 STEM, the focus is on creating an environment where students are passionate about issues of sustainability and capable of leading in the 21st century. There is strong community support and engagement from General Electric, NASA, The Great Lakes Science Center and at least 54 other organizations, companies, colleges and universities. 95% of juniors did summer internships and most juniors and seniors attend Cuyahoga Community College and Cleveland State University as part, or full-time students. In a stellar instance of project-based learning, a unit on DNA diversity and design culminates in students and faculty researching for a week at Biosphere 2, an enclosed scientific environment in Arizona for the past two years. MC2 STEM was rated Effective on the 2009/10 State Report Card.

2. In what other school transformation strategies has your school been engaged and its status.

In January 2010, CMSD launched a comprehensive and extensively researched Academic Transformation Plan (ATP) to respond to several long standing District challenges and to build upon pockets of excellence within the District. The ATP is the most thorough and ambitious in CMSD history and is notable nationally for its district-wide scope. It calls for fundamental changes in how schools are designed and operated, in how central services support schools, and in what is expected of principals, teachers, central office staff, students, families and the entire school community. Through "repurposing", "refocusing" and closing schools, the ATP aggressively addressed 60 of the District's lowest performing schools in 20010-11. Every District school is reevaluated annually to identify needed interventions and supports. New school models were, and continue to be, opened to spread innovative practices and to replace existing, failed schools.

The schools in this grant are designated "repurpose" based on the magnitude of school need. Intervention taken prior to the start of the 2010-11 school year included one or more actions: replace school leadership; require teachers to reapply to school; consider conversion to charter; or redesign academic program. Thirteen "repurpose" K-8 schools were designated as either Professional Learning Communities, Wraparound or STEM repurpose school models. Orchard school was designated "refocus" but is included in this grant as it had previously been designated as a STEM school.

As the first full school year of the ATP is drawing to completion, the yearly evaluation process identified an additional seven schools recommended for possible closure.

3. Describe the capacity your LEA/school has to ensure a successful implementation program.

With this grant, CMSD is building STEM capacity concurrently at three interconnected levels:

• School Building Level

Head of School Jeff McClellan, MC2 STEM Lead STEM Practitioners (LSP's), TIES, and the new position of PLSP are facilitating discussion with schools individually and as a group to assess at what level each is at currently as a STEM academy and providing supports to meet needs of the group and individual schools.

Internal Experts

The Strategic Planning process is developing the capacity within each school of principals, a core group of teachers, and a LSP teacher to make STEM happen in their school. These school staff members are the STEM "thought leaders" and early implementers who, by example and purposeful discussion with their teaching colleagues, parents and community partners, lead STEM activity.

• External Experts

CMSD will continue to work with TIES on the Strategic Planning process, and STEM staff regularly attends professional development activities. TIES is able to connect CMSD and these schools with emerging STEM practices that have potential viability as demonstrated in other exemplary STEM K-8 schools throughout the nation. With extensive past and ongoing training and workshop facilitation, Nick DiGiorgio also has the advantage of knowing how to work within the District and with key STEM district staff. A district based PLST is easily accessible which is a real advantage over an outside expert that is inherently less accessible due to scheduling and travel constraints.

The CMSD STEM implementation model insures that innovation is created, captured and spread through the PLSP and LSP's. Characteristics defining the PLST and LSP are:

- Agents of change who are part of the district and who share and understand the culture, conditions and possible obstacles
- Deep content professionals embedded within schools whose knowledge is shared across district schools creating a cohort of STEM LSP's. (2)
- CMSD LSP's work with other LSP's in the OSLN network, and have an ongoing relationship with Columbus's Metro School LSP's thereby spreading innovation across Ohio.
- LSP's embody the design process and are able to catalyze innovation in systems and in engagement with children
- LSP's are the knowledge capture system that documents learning and disseminates innovation

CMSD has played an instrumental role in STEM education in Northeast Ohio as a founding member of the MC2 STEM Hub of the Ohio STEM Learning Network (OSLN.) CMSD continues to play a major role in the operation of the MC2 STEM HUB, Ohio MC2 STEM Hub, OSLN's original Hub. The Hub assisted with the creation of MC2 STEM High School, regarded as a national model for excellence in urban STEM education. As evidence of the role it plays as a national model, Jeff Raikes, CEO of the Bill and Melinda Gates Foundation said last year about MC2 STEM High School, "Let me give you one of my favorite examples. MC2 STEM...is located at the headquarters of General Electric's Lighting Division. It's the epitome of hands-on curriculum. Students learn by doing. They learn that they can be bold about their talent--and audacious about what they plan to do with it. They learn to be the innovators this country needs." MC2 STEM High School functions as the design platform school for CMSD, disseminating promising practices and lessons learned to the six K-8 STEM schools and schools throughout CMSD, Northeast Ohio, Ohio and the nation.

Academic supports are in place to assist the six K-8 STEM schools with implementing STEM instruction. Annually the principal and teaching staff produces an Academic Achievement Plan, reviewed by the Chief Academic Officer, that includes plans for STEM learning. Also annually, a Scope & Sequence curriculum is reviewed, updated and distributed to schools. Currently, the process is underway of incorporating the national Common Core standards into the District's Scope & Sequence curriculum.

CMSD staff leading the transformation of the K-8 STEM schools are Eric Gordon, Chief Academic Officer, a national leader in urban education and overseer of CMSD's RttT efforts. MC2 STEM Head of School Jeff McClellan, is a former science teacher who has experience as an urban educator and principal. Lisa Baskin as Transformation Project Manager oversees the coordination of the six K-8 STEM school planning and implementation. (Resumes attached.) CMSD's Office of Institutional Advancement is assisting with fundraising from local and national sources.

Proposed to fulfill the role of PLSP, Nick DiGiorgio, MC2 STEM Assistant Head of School for the past two years, has nine years of experience at both administrative and teaching levels in CMSD. For CMSD he has been a Visual Arts Teacher for Early College High School and at an elementary school for the deaf, Artistic Director of the Lower Campus of the Cleveland School of the Arts and Arts & Technology Director of the Upper Campus of the Cleveland School of the Arts. His multiple years of experience at both the K-8 and high school level in CMSD make him unique among the LSPs and even MC2 STEM Head of School. DiGiorgio is currently responsible for STEM curriculum development, STEM professional development, creating a pool of STEM project/problem based learning projects for teachers to draw upon and lead facilitator for the Fab Lab. He has participated in Fab Lab training in the Netherlands and Norway; curriculum development at Rensselaer Polytechnical Institute and led and attended numerous professional development activities in Cleveland and Ohio. (Resume attached.)

Assisting CMSD as a consultant are Jan Morrison, President of TIES and a nationally regarded STEM education expert who served as the Consultant for the Bill and Melinda Gates Foundation as it supported the public/private partnership development of the OSLN and Ohio Board of Regents; and TIES Senior Consultant Mark Siciliano, a teacher, curriculum developer and instructional coach. (Bios attached.)

4. How will you integrate the specific Innovative Program into your school culture and current transformation plan/Scope of Work?

The STEM Innovation Program is already a core part of CMSD's Academic Transformation Plan. As part of the Scope of Work for Race to the Top, by 2014 CMSD will have implemented school-reform models based upon national promising practices that address persistently low performing schools. These models, such as the STEM schools, will ensure CMSD students and families have high quality choices to meet their educational needs. Through mutual agreement between CMSD and the Cleveland Teachers Union, these schools have been granted the autonomies necessary to accelerate change and increase achievement.

In 2010 CMSD began working with TIES on a Strategic Planning process to assist the K-8 STEM schools with implementing STEM instruction. TIES has conducted a Readiness and Capacity Survey and is producing a K-8 STEM Strategic Plan to be completed by June 2011. Professional development activities that have taken place and are ongoing are:

- MC2 STEM High School LSP's have facilitated two professional development sessions for all K-8 STEM teachers and two week long Professional Development Institutes for interested teachers focusing on the implementation of the MC2 STEM High School approach to trans-disciplinary project based instruction in the K-8 setting.
- Head of School has met biweekly with the principals of K-8 STEM schools to help facilitate the transformation process.
- Head of School has met monthly with K-8 STEM School Design Teams and lead the teams to agreement on district-wide K-8 STEM design principles and analysis of the STEM readiness surveys administered by TIES.
- Assistant Head of School has facilitated professional development sessions with K-8 STEM teachers involving use of the mobile Fab Lab in their school.
- Assistant Head of School and MC2 STEM students have worked with K-8 STEM teachers and students on school projects utilizing the technology of the Fab Lab.

In early 2011 TIES conducted a Readiness and Capacity Survey of the required capacity of the K-8 STEM schools. The guiding questions were "What are the key factors in leveraging readiness and capacity for these schools?" and "What components will drive the Strategic Plan for improving the performance of the K-8 STEM schools?" A Readiness and Capacity Survey and School Leadership Interviews were conducted. The survey was completed by 122 principals and teachers of the K-8 STEM schools and the majority of responses showed a positive and motivated attitude towards STEM. The survey showed that the majority of respondents are familiar with the intent of STEM education at CMSD and there is a high level of agreement with STEM-related instructional themes with 98% agreeing that "all students must be competent in literacy and problem-solving, and instructional tasks are designed to accomplish this goal." Further, 93% agreed that instruction should model real world context to engage students. Comments included the goal of having students "think outside the box; able to learn independently; be flexible, competent, tolerant, and able to express themselves clearly." While existing in some form at each school, the resources of space, people, time, materials and instructional programs are limited. These resource indicators will inform the Strategic Plan development.

The need for additional and sustained professional development was clear from survey responses and comments. Respondents reported the need for capacity to:

- Develop PD to support "What is STEM education?"
- Expand CMSD supported curriculum and instructional resources
- Develop and expand teacher instructional strategy practice
- Embed technology/engineering in the core curriculum
- Create opportunities for students to participate in STEM-related projects

Survey comments showed the need teachers have for workable approaches to incorporating STEM into their instruction:

- "I need to know how to implement Project Based Learning in my classroom and ideas of topics that will help me to use the Curriculum Scope and Sequence while doing this."
- "How do I launch engineering in my classroom? Using things students can relate to like toys, video games, bicycles, skateboards?"

From the Leadership Interviews, trends across multiple schools showed a need to develop capacity for:

- A school-based STEM coordinator or lead instructor with a strong pedagogical background
- Access to additional STEM curricula and instructional materials beyond current CMSD curricula framework
- Codifying of Design Features to provide more coherence around what is means to be a STEM school and what are the graduate profile and attributes for an 8th grade STEM student
- Additional and sustained professional development

Following the completion of the survey, with the MC2 STEM Head of School, principals and their school teams extensively reviewed, discussed and adopted a coherent set of Design Principles. These Design Principles are the basis of a platform from which to implement world class K-8 STEM schools that are high achieving and sustainable:

- K-8 STEM School will ensure opportunities for all students to be academically challenged while appropriately supported. There will be no academic admission criteria for any students.
- K-8 STEM School will start and stay small but have a "large district footprint"
- K-8 STEM School will use multiple metrics to measure success. Students will be expected to demonstrate mastery of curriculum in multiple ways and no one single measure of achievement alone will be considered an appropriate demonstration of mastery.
- K-8 STEM School's instructional program will reflect the need for all STEM
 work to be trans-disciplinary in nature. Students will be expected to master core
 literacy skills of writing, reading, speaking, listening, viewing, and presenting and
 STEM literacy skills of design, inquiry, invention, and teamwork through highly
 differentiated instructional programming.
- K-8 STEM Schools will ensure a regular culture of discovery, collaborative learning, content integration, and workforce relevance using a problem/project based approach.

- K-8 STEM Schools will provide at least 4 hours of common planning time per week for all teaching teams, grade level teams and leadership within the teaching day or, with permission, after school.
- K-8 STEM School will serve as a microcosm of the global STEM community. All STEM school partners, including students, parents, faculty, and staff, and community participants will be engaged in an array of opportunities to work collaboratively in leadership, internship/fellowship, advisories, mentorships, and service learning roles.
- K-8 STEM School will recognize the importance of citizenship and will ensure ongoing outreach opportunities that promote the strength of the school community and that ensure parents are actively engaged in their child's education in relevant meaningful ways.

From the strategic planning process with TIES, recommendations for Design Features for each school are currently being discussed and refined by school principals and teachers in a process facilitated by MC2 STEM Head of School and TIES. Recommendations being considered are:

- All K-8 STEM Schools have a themed STEM focus that is STEM literacy-based and supports "real world" issue work.
- The schools organize into two cohorts
- Three of the schools focus on "Green/Energy and Sustainability"
- Three of the schools focus on "Healthy Communities and Lives"
- Schools should choose their preference based upon:

Greater community focus

Assets in the community and within the school

Talent demonstrated in teacher-base

- All schools use Science Education for Public Understanding (SEPUP) as base science literacy curriculum
- All schools use an National Science Foundation evidence-based mathematics curricula that is compliant with the Common Core in Mathematics
- All schools create an innovative technology platform to support range of students and Project Based Learning focused work

The following Model for Internal Capacity Building and Transformation guides the process of developing STEM literacy in the K-8 STEM schools.

Model for Internal Capacity Building and Transformation

The overall goal is to conduct the process, informed by Design Principles, of school design, implementation and maturity for K-8 STEM schools in order to improve student achievement and connect STEM learning to real world issues.

1. School Level Discourse...A Conversation

To reach a level where:

- Teachers and other school staff share common understanding of STEM and Project Based Learning.
- Teachers and staff can articulate and discuss STEM and PBL concepts as they
 are implementing STEM in their school. A voluntary Critical Friends Group
 to look at curriculum and student work and think about better teaching
 practices will be established and meet semimonthly.
- Students, families, and visitors are immediately aware of the STEM learning environment.

2. Internal Expertise

To develop Internal Experts who continue to support the evolution of the school by:

- Ensuring that change occurring within schools is sustained
- Leveraging high level of experience in varying combinations of leadership, teaching, and STEM to:
 - -- Move the school vision forward
 - --Strengthen STEM learning among the six K-8 STEM schools
 - --Spread STEM further in the District
- 3. External Expertise...Catalyst for Transformation

To strategically introduce External Experts during the development process to support the School Level Discourse and Internal Expertise. These include MC2 STEM and Metro Heads of School and TIES staff.

Efforts are already underway to incorporate STEM learning with hands-on projects engaging students in the six K-8 STEM schools. These include using Lego Mindstorm Robotics kits; Climate Science Investigation projects; and visits of CMSD's MIT Mobile Fab Lab to give students the opportunity to design and construct projects which support three dimensional spatial visualization development. The spatial thinking made possible by the Mobile Fab Lab is key to STEM literacy as explained in a report by the National Research Council, "The key to spatial thinking is a constructive amalgam of three elements: concepts of space, tools of representation, and processes of reasoning. By understanding the meanings of space, we can use its properties as a vehicle for structuring problems, finding answers, and expressing and communicating solutions." (3)

All six STEM schools are participating in a STEAM (Science, Technology, Engineering, Arts, Math) event in May 2011. Each school will showcase their STEM projects at a public STEM and arts family day organized by CMSD at the Great Lakes Science Center and Rock and Roll Hall of Fame. In the future, a year end culminating exhibition and

celebration in May of district-wide STEM learning highlighting student, teacher, Design Team and LSP achievement and progress will be held.

5. How will implementation of this Innovative Program increase student achievement and progress in your LEA/school for all students?

STEM schools were selected as a school turnaround model based on prior results and national promising practices. For example, the Linden/McKinley turnaround feeder-pattern schools in the Columbus City School District demonstrate that the Ohio STEM Learning Network and Platform schools offer the proper support, knowledge and expertise in turnaround to increase probability that with the same processes and design principles, the CMSD STEM K-8 schools will succeed. The embedded use of the LSP's as coaches ensures that schools are ongoing institutions for adult and student learning.

Success at MC2 STEM High School, now in its third year, is evident. Design process and capstone learning, with an emphasis on spatial visualization, critical thinking and problem-solving as the basis for cognitive development, support the Ohio Department of Education assessments as seen in the below OGT scores:

	MC2STEM (9 th Graders)	CMSD (10 th Graders)
Reading	86.96%	63.8%
Math	86.96%	58.2%
Science	69.57%	44.4%
Writing	94%	67.2%
Social Studies	84.06%	54.8%

This innovation will help to ensure student achievement as it supports Haberman's good teaching practice for urban schools, "unlike the 'pedagogy of poverty,' good teaching occurs if students: solve problems that are of interest to them; explain human differences, see major concepts and big ideas...rather than accumulated facts; plan what they will be doing; apply ideals such as fairness, equity or justice; do experiments and construct things; reflect on real-life experiences; work in heterogeneous groups; think about an idea that questions...assumptions; relates new ideas to ones learned previously; access information through technology; and reflect on their own lives." (4) As stated in the vetted set of Design Principles, listed above in #4, which guide the implementation of STEM at the six K-8 STEM schools, "all students will be academically challenged while appropriately supported. There will be no academic admission criteria for any students" underscores that all students will be participating in STEM learning. With strong STEM programs in place, it's likely that more students will be retained and new ones will be attracted to these schools. A solid STEM program in the K-8 STEM schools will also increase the likelihood that more students will elect to attend one of CMSD's STEM high schools.

6. How will you sustain this Innovative Program post RttT?

CMSD's STEM model is designed to be sustaining through multiple factors:

- As the platform school, MC2 STEM will continue to foster and inspire the growth of STEM at the six K-8 schools, throughout the District, OSLN and nationally.
- The six K-8 STEM schools serve as platform schools for STEM in the District, disseminating STEM practices to other district schools, through OSLN and nationally.
- The agreed upon set of Design Principles guide all aspects of the six schools, including to "start and stay small but have a large district footprint."
- Being part of the OSLN, these six schools benefit from a consistent and reliable support system through OSLN connected users providing cutting-edge STEM curriculum resources, innovative STEM teacher professional development components, instruction suggestions, assessment ideas, and community engagement concepts.

Sustainability is also part of the design of the role of the PLSP. The web of LSP's are the mechanism that enable MC2 STEM, the design platform school, to grow innovation throughout the district in grades PK-12. All LSP's teach others as well how to become LSP's therefore addressing the need to build local capacity. The K-8 STEM need for external support diminishes as a network of support and shared knowledge is built as a backup system. After four years, the K-8 school based LSP's will be proficient enough in STEM learning to provide training to other schools in the District, OSLN and beyond.

The six schools are also continuing to make STEM part of their annual Academic Achievement Plans and allocating resources to STEM activities. As stated in the Design Principles, existing and new community and business partners "will be engaged in an array of opportunities to work collaboratively in leadership, internship/fellowship, advisories, mentorships, and service learning roles." Fundraising efforts are underway by CMSD's Department of Institutional Advancement to secure additional local and national sources of funding.

7. Describe any potential challenges or barriers with the mandatory professional development and Innovative Program requirements for the framework that you have selected. What strategies will your LEA/school implement to overcome these potential obstacles?

The potential challenges of integrating STEM into the overall curriculum as part of all subject areas will be addressed by the PLSP position funded by this grant request. Professional Development Institutes, held during scheduled monthly Early Release days, will give teachers examples of workable "Capstone" curriculum projects and ways to implement them. Using a "Capstone" approach to curriculum development, teams of students, teachers, and industry partners will collaboratively identify a current problem facing modern STEM industries, identify the curriculum objectives that are necessary foundational competencies in order to study the problem, and work as teams of

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researchers with host partners to propose explanations and test solutions for the problem. This provides a daily demonstration of the use of the design process to ensure that students master underlying scientific phenomena, and the logic of mathematics.

As part of the RttT memorandum of understanding with the Cleveland Teacher's Union, union leadership is paired with the district's Leadership and Growth Department to plan job-embedded professional development for all core faculty who will assume the primary responsibility for developing the significant professional development in areas including reliable measures of student growth, use of formative assessments, and implementation of new curricula.

8. How will the implementation of this Innovative Program increase college and career readiness of all students?

The continued dissemination of promising STEM education practices that are mapped to college ready/work ready attributes enables the K-8 STEM schools to back-map their vision and implementation of transformative STEM education to these attributes. MC2 STEM HS, Max Hayes and John Hay School of Science and Medicine all are benchmarked to college ready/work ready indicators. Using Dr. David Conley's work on college ready characteristics and guidance from ACT WorkKeys job skills assessment system and Center to Advance Teaching Science and Technology of the International Technology and Engineering Educators Association, the K-8s will be able to design their own benchmarks and indicators as well. This is a new area of importance for K-8 education and CMSD is poised to make a significant contribution to a more fuller understanding of the connection between a robust STEM education in the K-8 years and an increase in probability of college and work readiness and college and work-going. The Raytheon/Business-Higher Education Forum/Ohio State University STEM Analytics project is embedded in the OSLN and the STEM K-8 principals will make use of their findings to guide this benchmarking. (5)

With the STEM Design Principles that are woven through all instruction, K-8 STEM students will be STEM literate with a set of transferable skills to draw upon as needed during the high school, college and careers that await them:

- Being innovative, creative and skilled for the 21st century is based upon a child's ability to understand underlying phenomena and apply it in a novel situation.
- Being a critical thinker and problem solver involves the ability to manipulate a range of materials spatially and in three dimensions.
- Having personal and soft-skills mastery goes back to a child's ability to rely on their own judgement in unpredictable situations that demand communication to peers and adults.

Supporting the Design Principles are multiple strategies including the use of the MIT Mobile Fab Lab, a project/problem based learning environment, benchmarking of the Common Core curriculum standards in English Language Arts and Mathematics, and following the "Technologically Speaking" national technology standards.

9. Identify a timeline to achieve a successful implementation.

Please see attached timeline.

10. Why should your LEA/school be awarded an Innovative Programs grant?

CMSD is leading the state in STEM innovation and requests grant funds to leverage the STEM capability the District has built. With the high level of STEM expertise that has been developed internally, CMSD is well positioned to spread STEM knowledge to the K-8 level. Leveraging existing internal STEM expertise to do this is an innovative approach that is faster, more expedient and less expensive than relying on outside STEM consultants. Leveraging internal STEM expertise also is fundamental to sustainability, because as STEM literacy grows at the K-8 level, the need for external STEM support diminishes. CMSD is one of the few districts nationally developing STEM at the K-8 level, creating a model that can be replicated in Ohio and nationally.

Endnotes

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- 2. Increasing the Number of STEM Graduates: Insights from the U.S. STEM Education and Modeling Project, Business-Higher Education Forum, 2010.
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- 5. Conley, Dr. David (2007), General Characteristics of College Readiness.