Project Narrative: Table of Contents

Absolute and Competitive Preference Priorities Narrative

New York City Department of Education (NYCDOE) is submitting a development grant proposal to develop and evaluate its InnovateNYC Innovation Ecosystem, a network of schools, instructional designers, and investors who collaborate to develop more effective learning solutions that will help students overcome the specific learning challenges that inhibit their success in science, technology, engineering, and mathematics (STEM) courses. The ecosystem works by improving the exchange of information between schools, which understand students' needs, and those who design and fund the development of innovative new learning solutions to meet those needs. Assessment specialists work with InnovateNYC schools to identify the critical misconceptions and skill deficits inhibiting student achievement in STEM courses. InnovateNYC publishes those prioritized needs via crowdsourcing technologies to a growing community of learning scientists, instructional designers, product developers, and early-stage funders, who partner with schools to develop innovative instructional resources and products targeted to the published needs. InnovateNYC selects the most promising proposals and evaluates their efficacy by piloting them in schools using a rigorous experimental design research protocol. Effective solutions are purchased for large-scale implementation across the NYC school system. By creating a coordinated ecosystem of partners whose interests, needs, and resources are aligned, InnovateNYC will significantly improve both the number and the efficacy of innovative STEM instructional resources targeted to empirically defined learning needs.

This proposal seeks funding for the establishment of a small team to manage the ecosystem, seed funding to incentivize early stage innovations, and support for the evaluation of innovation pilots. The first phase of the initiative will target 10,000 high needs students in grades

5-12 (African America, Hispanic, English language learners, students with special education

needs, women) with demonstrated potential for advanced STEM study (See Appendix A and H).

NYCDOE will address absolute priority 2 and competitive preference priorities 7 and 10:

- By **defining a set of learning challenges that prevent students from enrolling and excelling in STEM coursework**, we expect to more effectively inform the development of targeted solutions in the market and increase the pipeline of innovations with the greatest capacity to enable middle and high school students to prepare for, enter, and graduate college with STEM-related degrees. (Competitive Priority 7)

- By **translating high impact STEM learning challenges into a set of prioritized solutions requirements, in such a way that sparks innovative solution designs**, we expect to increase the supply and demand for high impact learning technologies, instructional modules, and professional development supports that significantly improve student achievement in STEM coursework. (Competitive Priority 10)

- By **crowdsourcing, piloting, evaluating, and communicating outcomes of the most promising solutions to high impact STEM learning challenges**, we expect to more effectively meet the unique needs of the 1.1 million students in the largest school district in the country. (Absolute Priority 2)

Need for Project and Quality of Project Design

An exceptional approach to an unmet need

The Need: It is a nationally recognized problem that traditionally underrepresented

student groups (e.g. women, minorities, English language learners, those with special education

needs) are characterized by a low level of participation and success in STEM classes. It is also

known that this low participation and performance can negatively affect the opportunities and

choices available to students in those groups, significantly decreasing their long-term academic

and career opportunities. Inequitable participation and achievement are less visible in early years,

but steadily grow year over year. Perhaps most notably, differences in the National Assessment

of Educational Progress (NAEP) math scores between boys and girls nearly double between the

ages of 9 and 17.[i] To address these inequities in STEM participation and achievement, it is

critical that we intervene in upper elementary and middle school, when the foundations for later

participation and achievement inequities are being laid.

Of the 68,000 engineering bachelor's degrees awarded in the United States in 2006, only

12.5% were earned by underrepresented minorities, who represent nearly 30% of the overall

undergraduate student population. Even more inequitable were doctoral degrees in engineering:

only 3% of degrees awarded were to black, Latino, and Native American students, and 1.5% to

women. While there are 1.5 million engineers employed in the United States, only 9.5% are

women. Women received fewer than 35% of science, technology, engineering, and mathematics

degrees awarded in 2008.[ii]

Clearly the low representation of these groups in STEM-related careers is tied to low

participation and performance in STEM-related coursework in K-12 and college. And while

there are numerous cultural factors related to low participation in STEM courses among these

student populations, we believe these statistics are due in part to the lack of systematic applied

research into how these student populations could be engaged into STEM fields through more

diverse instructional approaches employing innovative new learning modalities, including those

that draw on games theory to increase student motivation and engagement, those that incorporate

immersive simulations and real-world problem solving to increase authenticity of tasks, and those that reflect the social nature of cognition and problem solving employed by practicing scientists, mathematicians, engineers, and technologists in the field. The most talented educators will continue to struggle to improve the engagement and performance of these student groups if they are not provided the tools that address the highest impact learning challenges. Developers cannot truly meet the needs of these student groups if they have no clarity around the highest impact learning challenges, the needs of schools, and are able to finance innovation. All students, but particularly those in these high needs group, will continue to struggle with STEM coursework and employers will continue to find it challenging to find talented students for STEM-related work for as long as this gap in understanding persists between those on the demand side and those on the supply side.

The proposed initiative, the InnovateNYC Innovation Ecosystem, is designed to better align the innovative solutions in the market (both existing and yet developed) with the most critical student learning challenges—those challenges that, if overcome, would unlock the potential for these students to excel in STEM coursework and careers. We believe that we can leverage the size and diversity of our district, as well as the resources and natural motivations of various partners, to direct the market to invest in more targeted, innovative learning solutions by better articulating student and educator need, providing clear metrics for how potential solutions will be evaluated, and recruiting partner schools willing to co-design and pilot promising solutions. We can influence the market to invest in these targeted solutions by committing to large-scale purchases of proven solutions and a sizable market to establish a presence. We would

also partner with philanthropic and private equity capital to help develop, evaluate, and scale the most promising innovations. (See Appendix C)

The Approach: While these students can be placed in a single category, they are surely not all the same. It follows that their challenges and the solutions to those challenges are different. Therefore, we have designed the InnovateNYC ecosystem to increase the pipeline of innovations that can meet those varying needs. We will approach the development of this innovation pipeline in two stages—early stage prototyping and large scale efficacy piloting. We will seed, prototype, and pilot up to 60 early stage innovations in classrooms each semester over three years (stage 1). Of the 60 early stage innovations, a subset will meet our efficacy and feasibility standards and be piloted at a larger scale using random assignment to pilot schools (stage 2). Developers will be required to fund development costs to get solutions pilot ready, as well as their pilot implementation costs. The InnovateNYC team will use a portion of i3 grant funds to seed early stage innovations and match those developers who show greatest stage 1 pilot results with foundations and private equity investors to support stage 2 piloting and expansion.

Creating an innovation ecosystem requires investing in a few specific components:

1. Methodologies for defining and prioritizing critical learning challenges. NYCDOE will use and adapt a methodology developed by the College Board to identify the fundamental learning challenges that are hindering students from successfully completing advanced courses in science and math. The methodology combines item-level assessment data analysis with professional judgment about learning progressions and teacher professional development to identify the most critical, actionable learning challenges that schools should address to raise student achievement. James Pellegrino, Distinguished Professor at the University of Illinois at

Chicago and head of several National Academy of Science/National Research Council study committees, will work with a STEM advisory committee to adapt this methodology using New York City NAEP fourth and eighth grade math and science data. The committee will also vertically align the learning challenges students face in upper elementary and middle school to those identified through the AP analyses in high school. This truly ground breaking work will establish for the first time a set of empirically validated, vertically aligned learning challenges that our students must overcome beginning in the earliest grades if they are to be successful in advance STEM courses.

2. A community of STEM subject matter experts, instructional designers, product developers, and funders who have the capacity and interest to develop innovative new instructional solutions to address the prioritized learning challenges. We will partner with incubators like New Schools Venture Fund, STARTL, ImagineK12, Games for Learning Institute (G4LI), and EdTech Entrepreneurs Lab to continuously scan and recruit edtech entrepreneurs who are bringing fresh approaches to STEM learning challenges. We will partner with STEM organizations such as American Association for the Advancement of Science [TBD], National Science Teachers Association [TBD], the New York Hall of Science, the American Museum of Natural History, and the College Board to recruit STEM curriculum and subject matter experts to work with product developers. We will partner with IDEO, a design and innovation consulting firm, to support the development of quality edtech STEM products by facilitating design sessions with selected entrepreneurs and NYCDOE schools. And we will partner with private foundations and venture capital firms to provide seed grants and early stage investments in promising entrepreneurs.

3. A platform for publishing the learning challenges to the community of solutions providers, and managing the submission, review, and selection of solutions. Ashoka Changemakers will provide an in-kind donation, the free use of its information exchange platform--*ChangeShop*—and its technical consulting support to manage the publishing of challenges and ―crowdsourcing‖ of solutions proposals.

4. A set of schools that have capacity and interest in engaging in a co-design process with instructional designers and product developers and pilot selected solutions through a rigorous experimental design to evaluate efficacy. We will recruit schools through the New York City Innovation Zone—a growing community of 180 forward-thinking schools that are incorporating technologies and innovative new practices to personalize learning to the needs, motivations, and strengths of individual students.

5. Evaluation of piloted solutions for impact on student outcomes and return on investment. We will partner with the Research Alliance for NYC Schools and the Center on Reinventing Public Education to evaluate selected innovations for impact on student outcomes and relative return on investment.

Goals, objectives, and strategy

The objectives of the InnovateNYC ecosystem are to increase the supply and efficacy of innovative STEM instructional resources in order to increase the number and diversity of students enrolling and succeeding in STEM courses. We intend to achieve these outcomes by 1) increasing the quality and availability of data on targeted, ―gateway‖ learning challenges that are hindering student success as defined by their performance on rigorous assessments; 2) increasing

the speed with which early-stage, innovative new instructional tools and resources targeting these learning challenges can be introduced to schools; and 3) increasing the quality and availability of data on the efficacy of selected solutions that schools are piloting and evaluating. By initiating this project in the largest school district in the country with a diverse student and educator population, InnovateNYC initiative will serve as a proof of concept for how large urban school districts (singularly, or as a consortium) can leverage demand to align private and philanthropic capital and the design energies of education entrepreneurs to develop innovative new solutions to students' and schools' needs. We will meet these objectives by pursuing four critical work streams, each with their own set of goals.

Partner management: In order to initiate the ecosystem project, we have identified a number of partners who can support key activities—identification and prioritization of learning challenges, translation of learning challenges into product requirements and communication of those requirements to a community of suppliers, evaluation of innovations and proposals, evaluation of pilots. High level goals:

- Develop processes, incentives, and terms by which incubator partners will recruit a pipeline of innovative STEM subject matter experts, instructional designers, and product designers focused on meeting the learning challenges published through the ecosystem.

- Establish formal memorandum of understanding (MOU) for all partners, outlining privileges of membership and expected contributions from partners.

- Recruit membership base sufficient to meet annual student, class, and innovation targets.

Seed investment activities: Recruit a diverse community of solutions providers, ensuring that small and large developers alike can compete for contracts. High level goals:

- Secure $1 million in seed funding from philanthropic and private equity funders

- Define terms for grants and investments that will create appropriate incentives for solutions

  providers and funders.

    Identify, prioritize, and publish learning challenges: To ensure that the ecosystem cultivates innovations that are specifically designed to address the highest impact needs of our students, the NYCDOE will partner with Professor James Pellegrino and the College Board to identify and prioritize the highest impact learning challenges that impede student participation and achievement in STEM coursework, based on item-level analysis of New York City NAEP grades 4 and 8 math and science data, professional judgment, and interviews with students and teachers. We will partner with Ashoka Changemakers and IDEO to translate those learning challenges into solutions requirements and publish them to an expanding community of solutions developers and investors. High level goals:

- Identify most critical, actionable STEM learning challenges facing New York City students, including those specific to under-represented student populations.

- Establish process for translating learning challenges into solution requirements.

- Establish process for publishing learning challenges to network of developers and investors.

    Pilot pipeline: The InnovateNYC team will manage the implementation of innovation pilots. This will include recruiting schools that have capacity and commitment to participate in a co-design and piloting process, ensuring schools and developers are provided with necessary DOE resources to appropriately implement innovations, and overseeing pilot evaluation. Throughout these pilots, InnovateNYC will publish outcomes and work with schools to make recommendations for solution modifications to developers. It will also share data and

information on efficacy and school demand through the Ashoka forums so that schools inside

and outside of the system can base purchasing decisions on pilot outcomes. High level goals:

- Recruit 14 schools in year one, 25 in year two, up to 50 in year three.

- Establish internal NYCDOE processes for rapid pilot preparation and piloting.

- Evaluate the efficacy of innovation pilots and their relative academic return on investment

- Reach 1,600 students in year one; 4,620 in year two, 10,000 in year three.

Strength of Research, Significance of Effect, and Magnitude of Effect

Research-Based Findings or Reasonable Hypotheses that Support the Proposed Project

In a recent Harvard Business Review article, Joanne Weiss, Chief of Staff to U.S.

Secretary of Education Arne Duncan, argues that the lack of innovation in education is not due

to a lack of creativity or great ideas. Instead, the demands of practitioners and the market

supply of innovation from entrepreneurs are simply misaligned."[iii] Weiss further argues, and we

agree, that the source of this misalignment, this barrier to introducing and scaling education

innovation, is largely due to lack of trustworthy and useful information flow between those who

have needs (schools and districts) and those who have capacity to develop solutions (developers,

funders, publishers). In the absence of good information, our schools are left to choose from a

supply of mediocre tools that fail to meet the needs of schools on a large scale. Our proposed

innovation ecosystem is designed to remedy this problem by positioning the NYCDOE and

specific partners as intermediaries of information, thereby filling the information gap between

those on the supply and demand sides.

The concept of an innovation ecosystem is also supported by leading experts in demand-

side innovation, like Jakob Edler, who argues that government agencies can effectively drive

innovation with ―a set of public measures to improve the articulation of demand in order to spur

innovations and the diffusion of innovations." In his analysis and our experience, cultivation and

articulation of true demand is a necessary precondition for the emergence of innovation and the

poor articulation of demand is the usual ―culprit in the case of sub-optimal supply."[iv]

If we want innovation to flourish, we cannot just concentrate on the technological base

and on innovation development. We must consider the true needs of those whom we serve and

give them voice in articulating the highest impact challenges that need a solution. This requires,

among other things, smart consumers (our schools, principals, teachers, students, families) as

well as properly functioning markets for new products or services. Educators should be able to

get trustworthy and useful information on products so they can decide what will work best for

their students. Developers should be able to hear feedback from users and learn what the pain

points and demand for certain technologies are. In the absence of this free exchange of

information and resources, the development and implementation of education innovations will

continue to be unacceptably slow.

By establishing an innovation ecosystem to connect highly-effective educators with high

potential entrepreneurs and strategically directing capital toward these projects, we expect to

spur the growth of the market for STEM education innovation, and finally bring the 1.1 million

of NYC students the benefits of the technology revolution in education. (See Appendix D)

The Proposed Project Has Been Attempted Previously, with Promising Results

The concept of an innovation ecosystem that effectively bridges the gap between supply

and demand side players is not a new one. It is, however, new to the NYCDOE and public

education systems around the U.S. We have seen three strong examples of an ecosystem at work and wish to apply lessons learned from those examples to the NYCDOE setting.[v]

Example 1 (U.S. Department of Defense): In 2002 the Department of Defense (DoD) created the Defense Venture Catalyst Initiative (DeVenCI) program to identify emerging technologies that might be useful to advancing defense and creating incentives for those technologies to be developed. DeVenCI does not make investments, but bridges private sector providers and public sector demand by brokering relationships between these technology companies and prospective DoD customers. DoD officials have publicly stated that the DeVenCI program has been highly effective at identifying, assessing and deploying innovations that would not have been scaled via more traditional procurement measures, which tend to cultivate solutions from a recurring base of suppliers. Our intent is to employ characteristics of the DoD's intermediary role, to spark and identify innovations by creating a system that opens the NYCDOE market for innovation to a larger group of suppliers.[vi]

Example 2 (California Environmental Protection): In an effort to reduce emissions, the state of California has spurred solar and alternative energy investment by steering funds and incentives toward both suppliers and buyers, first by mandating investment in solar infrastructure by the large investor-owned utilities in 2000, and later adding the requirement that these utilities provide the opportunity for solar users to sell back their extra solar-generated energy to the utility at set minimum rates. The state also added tax credit incentives and rebates to encourage homeowner and business installation of solar cells. According to the Clean Economy Network, California's progressive environmental regulations have not only created significant environmental impact, but also created jobs and economic growth in the state. Our intent is to

model California's efforts to stimulate both supply and demand within the education space, by committing incentives to STEM-related learning challenges that, if addressed, stand to significantly improve student performance and engagement.

Example 3 (Central Intelligence Agency): In-Q-Tel, established by the CIA, is a nonprofit venture firm that partners with the CIA to define the critical intelligence-community needs, source companies and technologies that are best poised to address those needs; make equity and other investments to accelerate the development of relevant solutions; and help to match those solutions with national security and intelligence-related customers. In-Q-Tel connects emerging technology innovations (the supply side), the most important needs in the field (as defined by the CIA and others on the demand side) and private investors who bring expertise and have economic incentives to support these companies. While still in its early stages of operation, the latest independent report on In-Q-Tel effectiveness has concluded that the organization's approach to sourcing innovations has rivaled the private sector in the speed with which innovations are identified, sourced, and deployed.[vii]

Improving Student Achievement or Student Growth

Examples of effective ecosystems in other industries are very promising and give us greater confidence in our ability to model those success stories in the education space. With a large and diverse population of students, schools, solutions developers, and capital investors, the InnovateNYC innovation ecosystem will be well positioned to directly impact the lives of students around the system and the country. By focusing the energy of the ecosystem on STEM learning challenges, we expect to significantly improve the achievement of our students in areas

of study that will have some of the greatest influence on their growth, productivity, and

opportunities, as students and citizens.

Quality of Project Evaluation

The NYCDOE proposes to engage the Research Alliance for New York City Schools at

New York University to oversee the independent evaluation of the i3 development project:

InnovateNYC: An Innovation Ecosystem for Urban School Districts. The Research Alliance will

conduct a study of the initiative's implementation, impact, and costs over a three-year period.

The evaluation will examine the initiative at the system level and at the level of individual

interventions that grow out of the innovation ecosystem. It will address the following questions:

*Ecosystem documentation study: Describing the implementation, costs, and overall

effectiveness of the InnovateNYC Innovation Ecosystem.* How do key components of the

InnovateNYC ecosystem support the processes of identifying STEM-related learning challenges,

facilitating two-way communication between schools and the suppliers of solutions, and

selecting and deploying the solutions that are developed? What costs are incurred under the

innovation ecosystem strategy, including costs for development, deployment and modification in

new STEM-related interventions? What factors enhance or limit effective execution of the

ecosystem approach and what lessons do these challenges offer NYC and other districts who

seek to undertake the further development or expansion of this approach?

*Evaluating the implementation and impact of specific interventions that arise from the

ecosystem.* What impact do particular innovations have on student achievement in math and

science and on students' attitudes toward STEM learning activities and career opportunities?

What is the impact on underrepresented or underachieving students in STEM-related learning

activities? With what level of fidelity are the new interventions implemented in science and mathematics classes and how different are these interventions from the science and mathematics classes and related learning activities that would otherwise be available? What is the cumulative impact of the set of initiatives that are developed and deployed under the InnovateNYC innovation ecosystem?

The overarching goal of the evaluation will be to provide the NYCDOE with both formative information about the development process and roll out of the initiative and rigorous summative evidence of its early impacts on student engagement and performance on STEM-related outcomes. By providing evidence that can serve as a ―proof of concept," the evaluation plan will expand knowledge about how large urban districts can leverage smart demand to align private and philanthropic capital and the design energies of education entrepreneurs to develop innovative new solutions to our schools' STEM needs. In addition , the study will identify necessary factors to expand the InnovateNYC ecosystem for a more comprehensive efficacy evaluation and export the model to other districts.

Methods of Evaluation Are Appropriate to the Size and Scope of Project

The Research Alliance will undertake a mixed method evaluation approach. The evaluation will proceed in parallel with the development and roll out of the initiative. As discussed below, the first year of the project will focus on a careful needs assessment and diagnosis of STEM-related learning challenges in New York City. This will yield a set of solution requirements and design specifications that will guide developers and vendors as they prepare new interventions to meet these needs and challenges. During this first year, therefore

the evaluation will focus most heavily on documenting the development of the innovation

ecosystem and mapping the flow of information among the key stakeholders.

We will continue to follow this evolution in the second and third years of the study but

will shift emphasis to assessing the impact and implementation of specific interventions. The

NYCDOE expects that the first year of the initiative will result in a limited number of new

interventions and that this number will grow substantially as the ecosystem evolves. Thus, the

impact component of the evaluation is likely to include only two interventions in the first year

followed by four interventions in the second year and six in the third. As discussed below, the

impact evaluation will focus on a subset of the new interventions, targeting those that are well-

aligned with the design specifications that emerge from the development process and that can be

implemented with a reasonable degree of fidelity. We will work with the NYCDOE and other

stakeholders to make these determinations. Following is a more detailed overview of the

methods that will be used at each of the two overarching components of the evaluation.

Ecosystem Documentation Study: Describing the implementation, costs, and overall

effect of the InnovateNYC Innovation Ecosystem. This component of the evaluation includes

three elements: 1) creating a map of the InnovateNYC ecosystem; 2) assessing costs associated

with development and deployment of solutions via the ecosystem; 3) synthesizing cumulative

effectiveness and return on investment.

The first element will begin with careful documentation of the Learning Challenge

Identification process. This process begins initially with the identification and prioritization of

the highest impact learning challenges that impede student participation and achievement in

STEM coursework, based on item-level analysis of New York City NAEP grades 4 and 8 math

and science data, professional judgment, and interviews with students and teachers. It continues
with the solicitation, design, and selection of innovative interventions that aim to address those
needs in specific schools and classrooms. It also includes the process by which schools, teachers
and students are targeted and selected for the interventions.

To accurately capture both the overall flow of information, resources, technical
assistance, and feedback, the Research Alliance will deploy field researchers to interview the key
actors and stakeholders involved at each stage of the process, including NYCDOE staff who
oversee the InnovateNYC initiative. It also includes the College Board and others who conduct
the STEM-related learning needs assessments and the developers and innovators who respond to
the call for promising intervention strategies. We will also interview school leaders and teachers
who are responsible for assessing the fit between their needs and demands and the supply of
interventions that are presented for consideration. Finally, we will interview the investors who
support the work. Our field researchers will also observe meetings and discussions that direct
key decisions about both overall strategy and specific design and deployment issues. The
primary goal of this work is to craft a detailed, evolving map of the web of information,
resources, and technical assistance that make up the InnovateNYC ecosystem.

The Ecosystem Documentation Study will also include an analysis that assesses the cost
of developing and implementing these new interventions. To collect gross cost estimates, the
research team will rely on NYCDOE records and financial information provided by both vendors
who conduct the needs assessments and developer solutions. As part of this work, we will make
an effort to parse out net costs of specific interventions over and above the costs associated with
existing STEM-related classes and learning opportunities for students. To estimate net costs of

the new interventions, we will determine the degree to which the interventions added to scheduled class time or are provided as supplemental learning activities or whether they displace or substitute for scheduled class time or other instructional resources. This information will enable us to net out the costs associated with the time teachers would otherwise spend in class and with the other resources used in a traditional instructional setting.

Finally, the third element of the Ecosystem Documentation Study involves a synthesis of findings from the impact analysis of specific innovative interventions. These impact studies, which are described in more detail below, will encompass 12 randomized controlled trials (RCT) that will take place over the three-year project. Each RCT will yield internally valid estimates of the impact one intervention has on student achievement and attitudes. They will encompass a mix of grades (most likely grades 4, 8, and 9) and will focus on either science or mathematics. Using meta-analytic techniques, the research Alliance will develop an overall estimate of impacts across interventions. This estimate can provide an indication of overall effectiveness and would serve as the primary indicator for a return on investment analysis.

The short-term goal of the cost and return on investment analysis will be to estimate the effectiveness of the different interventions. Over the 3 year period of this grant we will examine differential effects across interventions per dollar invested. It will also be important to distinguish costs of the initial development of innovative solutions from costs that are likely to reflect a steady state that redistributes these up front investments. A longer term goal–beyond the scope of this project–would be to determine the overall cost effectiveness of the ecosystem compared to a more typical ‑supply-driven" procurement process. Such a study, however, would

involve a closer examination and understanding of supply-driven reform process and costs, which has rarely been the subject of systematic study.

The Ecosystem Documentation Study will yield annual reports that describe the key steps in the innovation development process and discuss the key decisions, information flows, and interactions among key actors that were instrumental in the process. Each annual report will also document how the ecosystem is evolving and will identify challenges that inhibit the flow of needed information between the demand and supply sides of the initiative.

The Ecosystem Documentation Study will also include a final synthesis report that summarizes findings from the descriptive analysis, cost study, a synthesis of the impact evaluations. The final report will also offer lessons for NYCDOE and other districts that may wish to create or expand this approach to innovation and problem solving.

Evaluating the Implementation and Impacts of Selected Innovations. Plans for developing and implementing InnovateNYC include an aspiration to identify and deploy up to 10 new interventions in the first year, increasing to 20 and 30 the following years. These interventions will focus on either math or science and will be targeted to high needs students in one or more grades ranging from 4 through 12. Given the resources available for the evaluation, the Research Alliance will conduct a total of 12 rigorous impact and implementation studies, starting with two the first year and working up to 6 in the final year.

While the selection of these studies will need to be guided by the implementation dynamics of the initiative and the operational realities of the selection and deployment of interventions, we will prioritize interventions that appear to be the most aligned with both student achievement and development outcomes and have a record of implementation. In short,

we will work closely with NYCDOE, the content experts involved in the early stages of the project, and the developers to minimize the risk of evaluating interventions that require pilot testing and significant refinement prior to a rigorous impact analysis. Recognizing the need for new initiatives to undergo a mutually adaptive design and implementation phase, we will focus instead on interventions that are most likely to reflect a test of the strategies and frameworks that will be specified in the design requirements.

We will also prioritize interventions that are targeted to grades in which students are required to take New York State assessments in math and science. For the purposes of this proposal, we have designed a series of experiments that target students in Grade 4, 8 and 9 (elementary, middle and high school grades when students take state assessments in both math and science). Interventions that emerge from InnovateNYC are likely to range from 8 weeks of treatment in some classes to a full year or more in other classes and schools. In years 2 and 3 of the grant, we will target interventions designed for at least one full semester and ensure that at least one experiment each year focuses on a year-long intervention.

The impact studies will be designed with individual science and math classes as the units of treatment, random assignment and analysis. Each experiment will involve a minimum of 12 classes with six classes randomly assigned to a treatment group and six assigned to a control group. While these classes would be taught by different teachers, they may be distributed across several schools or clustered in fewer schools. We expect each class to include 20-25 students. We will rely on pooling estimates across 12 experiments, 12 classes per experiment, to detect an impact of approximately .13 standard deviations on math and science test scores, which is equivalent to approximately 4 percentile points on a normed reference test. (See Appendix J)

The impact studies will focus on two sets of outcome measures. First, we will collect data on students' math and science test scores. For grades 4 and 8 these instruments are administered annually as part of the New York State standards assessment program. For grade 9 (and grades 10, 11 and 12), students take New York State Regents Examinations at the conclusion of specific science and mathematics courses. We will target interventions which focus on Regents exams typically taken in 9th grade, including Integrated Algebra and Living Environment or Earth Science. Second, we will utilize data collected with survey instruments that assess students' cognitive, emotional, and psychological development and which have been shown through empirical research to positively impact student success in college and career. The NYCDOE I-Zone has identified a ―Habits of Mind" survey instruments that are administered at the beginning (pre-test) and end (post-test) of each school year to students in each school that is implementing an I-Zone intervention. The research team will work directly with each school in each of the experiments to ensure that all students in both the treatment and control groups complete the ―Habits of Mind" survey, which is available online and can be completed in 30-40 minutes.

In addition to the randomized control trials to assess the impact of these interventions, the Research Alliance will also conduct systematic implementation studies to assess the fidelity of their implementation and the contrast between classes that use the interventions and the control group classes. This will be carried out by our field researchers using highly structure protocols and check lists that are designed in consultation with the developers. These data will be coded and analyzed to create measures of intervention fidelity and to assess key differences between intervention classes and classes in the control group. These two factors will provide important contextual information about whether and how the interventions are resulting in high quality and

innovative teaching and learning opportunities in classrooms. Overall, the impact and implementation studies will examine the challenges and opportunities raised while rolling out the new interventions, in addition to measuring the degree to which the interventions influence student achievement in STEM-related learning activities.

The Implementation and Impact Studies will yield a total of 12 reports that provide a summary of the key findings from each experiment. Each report will include information about the fidelity of implementation and estimates of impacts on study achievement and the survey measures of students' cognitive, emotional, and psychological development.

Methods of Evaluation Will Provide High-Quality Implementation Data and Performance Feedback, and Permit Periodic Assessment of Progress

The Research Alliance will provide the NYCDOE with both formative and summative assessments of the InnovateNYC ecosystem and the innovations that are produced from it. The Research Alliance will provide periodic briefings every three months to the NYCDOE on the opportunities and challenges of implementation, enabling the Department to in turn make any needed midcourse corrections or changes to its strategy. The briefings will also include other stakeholders involved in this InnovateNYC ecosystem, including funders, capital investors, and solutions developers. Yearly summative assessments of the impact of the innovations on improving participating in STEM courses will further support the Department's efforts at making critical decisions about future expansion of the program.

The Research Alliance is uniquely positioned to conduct this evaluation given its commitment to research rigor and independence, its collaborative working relationship with the

NYCDOE and other education stakeholders across NYC, its capacity to form and manage

partnerships with researchers and research organizations, and its direct access to NYCDOE data.

***Evaluation Will Provide Sufficient Information to Facilitate Further Development,
Replication, or Testing in Other Settings***

The Research Alliance will publish the results of their summative reports to facilitate the

communication of their findings for other school districts, policy makers, researchers, program

developers, and others to replicate. The extensive data collection and analysis of this project will

allow us to summarize which practices, institutional arrangements, professional development

activities and strategies for school support have been the most effective at providing the pilot

schools with the resources they need to improve STEM-related challenges. We will analyze all

of the results of the research to identify the essential factors that are crucial to both creating a

demand-driven ecosystem for procuring high-quality products and services to schools and

developing innovative tools to improve achievement in STEM-related learning activities.

Project Plan Includes Sufficient Resources to Carry Out Project Evaluation Effectively

The impact analysis, implementation study, and costs study will draw upon a

combination of existing NYCDOE data and supplemental data collection efforts. The Research

Alliance already has a formal agreement (MOU) with the Department that allows them to obtain

a wide range of administrative records and other data for research purposes. The agreement is in

place for the next few years and will cover the data transferred for this research project. The

MOU with the NYCDOE has allowed the Research Alliance over the past two years to create an

extensive archive of NYC student and teacher data. These data include student-level

demographic information, standardized test scores, graduation/school leaving information,

extensive transcript information for middle and high school students, and a host of other

administrative data since the early 1990s.

Strategy and Capacity to Further Develop and Bring to Scale

Number of Students to be Reached by the Proposed Project

The InnovateNYC education innovation ecosystem will reach 10,000 high needs,

underserved high school students across the five boroughs with demonstrated potential for

advanced study in STEM. We will reach about 50 schools that have a predominant population of

target students. The chart below shows the number of students and schools reached each year:

	Year 1	Year 2	Year 3	Year 4	Year 5	Total
# Students	1,680	2,940	5,880	11,760	33,600	55,860
# Teachers	56	98	196	392	1,120	1,862
# Classes	28	49	98	196	560	931
# Schools	14	25	49	98	280	466
Cumulative # of Students Reached	1,680	4,620	10,500	22,260	55,860	
% of NYC students	*0.2%*	*0.4%*	*1.0%*	*2.0%*	*5.1%*	

Capacity of Applicant & Partners to Develop Program & Bring to Scale

By the end of the three-year grant project, the InnovateNYC ecosystem will be serving

10,000 students and poised to serve up to 55,860 in five years. A great strength of the

InnovateNYC ecosystem concept is that once members are identified, recruited and connected to

the community via the Ashoka *ChangeShop* platform, the cost of expanding the membership of

the ecosystem will be minimal. The value of membership however, increases as the membership

increases. With increased membership of districts and schools comes an increasing market for

developers to supply. With increased membership of solutions developers comes an increase in

the pipeline of potential solutions and a greater likelihood of meeting critical learning challenges. With increased funder membership comes an infusion of capital and greater incentives for solution development and resources for implementation, evaluation, and scaling.

Recognizing that it is non-traditional for a school district to develop and scale its programs in different geographic locations, and because the value of the InnovateNYC ecosystem to its membership increases with the size of its membership across varied geographical settings, including rural settings, InnovateNYC will explore a number of options to support scale-up, including working directly with the State of New York and/or other school districts, creating a 501(c)(3) to provide services outside NYC, and continuing work with existing partners. These plans would include ensuring we have the internal capacity to manage a growing base of ecosystem members and evaluators, maintain a strong partnership with Ashoka to support the enhancement of and access to their information exchange platform (or an alternative), and provide the necessary training for districts outside of NYC.

Multi-district Expansion: The InnovateNYC ecosystem is entirely applicable to other district environments. We expect that after proof of concept, other districts would actively support expansion of the InnovateNYC model to their environments to increase the pipeline of innovations to their districts as well. Our initial focus would be on large urban districts, followed by mid-sized and rural districts.

Information Exchange Platform: The Ashoka platform will be made available to InnovateNYC free of charge for the duration of the project to prove the ecosystem concept. Ashoka has held as a charter policy from inception to not accept public sector funds. Essentially, this policy reflects a belief that by operating independent of public sector funding the

organization is not subject to shifting political winds or decision making. Furthermore, the policy affords Ashoka the ability to create a truly independent agenda, one that allows it to pursue innovation and transformational change in any sector, or area. As such, before the conclusion of this project, Ashoka and the InnovateNYC will have developed an agreement that will ensure continued use of the data exchange platform.

Private Sector Investment: In 2002 Mayor Michael R. Bloomberg and Chancellor Joel I. Klein established public-private partnerships as a critical means of supporting public education reform. The Fund for Public Schools ("The Fund") is the primary vehicle for advancing this effort. Working in collaboration with the NYCDOE's Innovation Zone and the Office of Strategic Partnerships, The Fund attracts private investment for system-wide reforms and initiatives that support individual schools. Since 2002, The Fund has raised more than $230 million, including a $17.9 million gift from the GE Foundation, the largest single corporate contribution to New York City public schools. The Fund will assist InnovateNYC in developing private partnerships, fundraising to meet 15% match requirement (and cover Curriculum Specialist and a Portfolio Analyst), and bringing the Education Innovation Ecosystem to scale.

The Feasibility of Successful Replication in a Variety of Settings

Once the InnovateNYC ecosystem concept is proven, successful replication is dependent on a replication/expansion plan with a strong set of protocols and procedures. In the case of InnovateNYC, this includes a number of resources beyond the technology platform, including a set of ecosystem membership criteria, a national awareness campaign plan, direct engagement with superintendents of other large urban school districts committed to innovation, effective

incentive packages, and funding agreements. Using these tools will help to assure the quality and

fidelity of the model as it expands to more districts.

Cost of Project, Cost Per Student, and Cost to Reach More Students

The NYCDOE is requesting a 3-yr grant in the amount of $3,000,000 from the i3 program

to support a robust set of development, implementation, evaluation, and innovation

dissemination activities over the course of the three year project period. The majority of the

funds are allocated to partner management and pilot & ecosystem evaluation. These costs assume

an average grant award or seed investment of $20,000 to promising early stage innovations and a

one-time $350,000 investment in the identification of key learning challenges. This budget also

assumes an annual $469,200 investment in expanding the iZone team to include additional

resources to support portfolio management, pilot, and evaluation activities. The cost per student

reached is $726 in the first year, but significantly drops 68% to $232 per student in year 2 and

another 48% to $121 dollars in year 3.

Projected 3-Yr Costs	Year 1	Year 2	Year 3
Learning Challenge Identification	**$350,000**	**$0**	**$0**
Seed investment	**$200,000**	**$400,000**	**$600,000**
New Pilots	10	20	30
Cumulative # of Pilots	10	30	60
Avg Seed Investment	$20,000	$20,000	$20,000
Pilot Management & Evaluation	**$372,500**	**$372,500**	**$372,500**
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Partner management	**$297,300**	**$297,300**	**$297,300**
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Total Cost	**$1,220,400**	**$1,070,400**	**$1,270,400**
Total Students Reached	1680	4620	10500
Cost per student	$726	$232	$121

* Funded with matching funds, pursued in partnership with the Fund for Public Education

With the same model, costs per student continue to decrease as the size of the ecosystem increases and the number of innovations increase. While we would expect to require periodic re-assessments of student learning challenges every 3-years and increased investments in evaluations for an ecosystem running up to 60 early innovation pilots in a single year, the basic assumptions made in cost drivers leads us to believe that the trend of cost per student decreases as the number of students increases. Developers will be required to fund development costs to get solutions pilot ready, as well as their pilot implementation costs. The InnovateNYC team will use a portion of i3 grant funds to seed early stage innovations and match those developers who show greatest stage 1 pilot results with foundations and private equity investors to support stage 2 piloting and expansion. Using these same assumptions, we would expect the cost per student to decrease to $19, $19, and $7 for a population of 100K, 250K, and 500K students, respectively.

Plan for Dissemination and Further Development or Replication

Numerous recent convenings and publications have raised interest in the idea of creating an innovation ecosystem in education, and this proposal sets out to launch the first proof of concept of those ideas. The Innovations in Education forum organized by the Advanced

Leadership Initiative at Harvard University; the work of Kim Smith and Julie Peterson at Bellwether Education Partners; the focus on smart demand at this year's New Schools Venture Fund Summit; the investments of Bill and Melinda Gates Foundation, The Michael and Susan Dell Foundation, and the Carnegie Corporation of New York in a Shared Learning Infrastructure, all have raised tremendous interest in the potential for creating more open and efficient ecosystems for innovation in education. Thought leaders involved in these national initiatives have advised us on the design of this proposal, and we will continue to work with them to ensure that lessons learned from this proof of concept will inform the national conversation. We will also engage directly with superintendents of other schools districts (urban and rural) who singly or collectively can create the necessary demand required to incentivize and direct private sector investment toward prioritized needs. As the largest school district in the country, New York City can provide leadership in this area in a way that will naturally attract further participation from other districts (large and small) if we prove the concept to be viable in the execution.

Sustainability

Resources and Support to Operate Beyond the Length of the Grant

The NYCDOE created the Office of Innovation in 2009 to lead the development of innovative new initiatives that have potential for large-scale, high impact on increasing student achievement outcomes in New York City. The Office reports to the Deputy Chancellor for Talent, Labor, and Innovation, David Weiner. The Chancellor and leadership of the NYCDOE are fully committed to the this proposal as a means for piloting and evaluating whether such an innovation ecosystem can feasibly be established and scaled in New York City and, most importantly, whether this approach to increasing innovation has an impact on student outcomes.

Thus the existing capacities of the Office of Innovation and the NYCDOE leadership's

commitment to the initiative will ensure that a successful pilot will be sustained and scaled as

appropriate beyond the term of the grant. Moreover, if designed correctly, InnovateNYC will

create the right mix of incentives, opportunities, and value to elicit resource investments from the

private sector to sustain the ecosystem in order to realize the greater benefits that come from

aligning supply and demand to real needs.

Incorporation of Project into Ongoing Work of Applicant and Partners

The InnovateNYC ecosystem is an extension of the work that we and our partners are currently

doing. One of the greatest strengths of the initiative is that it integrates a currently fragmented

market for solutions to learning challenges, providing all members with natural incentives to

work together. We have received so much excitement and support from partners to develop this

concept because it aligns with their mission, objectives, and commitment to increasing the pipeline of

students who are pursuing advanced study in STEM courses in high school and college. For our

incubator partners, the ecosystem provides a pipeline of lab site schools to co-design innovative new

products and solutions. Via this initiative, the NYCDOE and Ashoka are working together to develop a

sustained innovation community, focused on critical social change issues.

Quality of the Management Plan and Personnel

Clearly defined responsibilities, timelines, and milestones

Project management will be guided by our Chief of Strategy and Policy (CSP) with the

assistance of an Executive Director, who will be the primary contact for i3. The main

responsibilities of the CSP will be to develop a long-term strategy for the InnovateNYC

ecosystem, consistent with the mission and vision of the Office of Innovation and to develop

critical partnerships that resource the initiative.

The Executive Director will be responsible for the integration and coordination across all

work streams, including partner recruitment and management, solutions development and pilot

management, research and evaluations. With the workstream leads, he will track progress of the

overall project plan and identify and resolve risks to implementation through the project. The

executive director will oversee all administrative and back-office operations. He will also work

with the InnovateNYC portfolio manager and partners to craft incentive packages that solidify

partner involvement.

All partnership development and ecosystem communication activities will be managed by

our Portfolio Manager. She will lead the effort to assess the needs of the ecosystem, develop a

set of criteria to guide efforts to recruit new partners, and strategically recruit partners that are

best positioned to fulfill the needs of the ecosystem.

All pilot activities will be managed by our Product Director. His primary objective is to

align all necessary resources from partners and internal NYCDOE teams to successfully plan for,

set up, implement, and evaluate pilot innovations. He will collaborate with partners to translate

school needs into product requirements for targeted innovations.

We will hire a Curriculum Instruction Specialist to oversee alignment of innovation

selection and piloting, evaluation, and school/district partnerships to iZone mission and DOE

academic priorities.

The operating budget will be managed by the iZone operations team and overseen by the

Executive Director. The iZone operations team will refine the long-term budget model for the

initiative, meet with staff to assist and develop assumptions that impact the budget, and monitor

the fund allocation and spending to ensure the initiative meets its targets and obligations.

The table below summarizes the milestones and timeline for the initiative's three primary

workstreams: portfolio management, pilot management, research and evaluation. The Executive

Director is responsible for the successful completion of these activities. He will be meeting with

the iZone leadership and each worskstream lead on a weekly basis to monitor progress and

course correct as necessary.

Milestone Activities by Workstream	Owner	Yr 1	Yr 2	Yr 3
Portfolio Management				
• Finalize ecosystem membership requirements and expectations	Portfolio Mgr	X		
• Establish formal partnerships with ecosystem members	Exec Director	X		
• Solicit solutions to STEM learning challenges	Curriculum Specialist, Partner (Ashoka)	X	X	X
• Confirm seed investors	Exec Director, Partner (Startl)	X		
• Establish scaling partnerships (e.g. partner districts)	Chief of Strategy, Curriculum Specialist		X	X
• Incorporate ecosystem membership into Ashoka platform	Portfolio Mgr	X	X	X
• Identify and recruit member schools	Portfolio Mgr	X	X	X
Pilot Management				
• Develop criteria by which to assess pilot-worthiness of innovations	Product Director	X		
• Determine treatment and control schools	Product Director, Evaluator	X	X	X
• Translate key learning challenges into a set of solution requirements	Product Director	X		
• Lab school infrastructure evaluation and upgrade	Product Director, DOE IT group	X		
• Organize any necessary professional development for teachers and/or students	Curriculum Specialist, Developer	X	X	X

• School evaluation of innovations and co-design of solutions	Product Director, Developer	X	X	X
• Ongoing pilot support	Product Director, DOE IT group	X	X	X
Research and Evaluation				
• Identify highest impact STEM learning challenges	Curriculum Specialist, Partner (College Board)	X		
• Conduct focus groups; collect and format achievement outcomes data; administrator follow-up surveys	Evaluator		X	
• Complete data analysis and evaluation	Evaluator			X
• Submit quarterly reports	Exec Director	X	X	X
• Submit annual report to Secretary	Exec Director	X	X	X
• Submit final performance report	Exec Director			X

Qualifications of Key Project Personnel

Arthur VanderVeen is Chief of Strategy and Policy for the Office of Innovation at the New York City Department of Education. In this role, he leads the iZone initiative, a community of innovative New York City schools committed to personalizing learning to the needs, motivations, and strengths of individual students. Prior to this, he managed the administration and development of the DOE's portfolio of summative and formative assessments. He also directed the DOE's Educational Technology and Knowledge Management initiatives.

From 2003 to 2007, he held several positions at the College Board, where he helped lead the design of the College Board's comprehensive school reform program. He also led the development of the College Board *Standards for College Success in Mathematics and Statistics and English Language Arts*.

From 1997 to 2002, he founded and directed ActiveInk Corporation, a curriculum development and publishing company in Austin, Texas, which provided curriculum development services to state education agencies, K-12 school districts, and publishers in multiple disciplines.

He has received a B.A. from Colorado College, an M.Div. from Princeton Theological Seminary, and a Ph.D. in English from the University of Texas at Austin.

He has authored numerous chapters, articles, and presentations on college readiness, assessment design, comprehensive school reform, academic content standards, curriculum development, and alignment methodologies.

M. Très Watson is an Executive Director of the New York City Department of Education's Office of Innovation, and the lead on the InnovateNYC ecosystem project. His background covers information technology consulting, software start-ups, non-profit management and growth strategy. He previously served as a managing director for growth strategy and development at Teach for America.

Très is a graduate of both the Harvard Business School, where he received his Masters in Business Administration and the Harvard Kennedy School of Government, where he received his Masters in Public Administration. While in graduate school, he studied as a Zuckerman Fellow and a William George Leadership Fellow.

Très has spent the majority of his professional career in consulting and business development. However, his passion continues to revolve around education, youth development and mentorship. Très received his undergraduate degree in Commerce from the University of Virginia, where he co-founded Brothers United Celebrating Knowledge and Success, a nonprofit devoted to creating public/private partnerships to construct computer labs in public housing projects in the State of Virginia. Très also serves on the board of VisionQuest International, offering curriculum development, organizational strategy, and facilitation advisory.

Dr. James Kemple (Research Alliance for NYC Schools) is the Executive Director of the Research Alliance for New York City Schools. He is a leader in the field of education research with a specialty in the design and management of rigorous evaluations, including randomized controlled trials of educational and other social policy reforms. Prior to coming to the Research Alliance, Dr. Kemple worked at MDRC, a non-profit social policy research organization committed to improving the well being of low income populations across the United States, where he was the Director of their K-12 Education Policy Area and served as Principal Investigator (PI) on a number of studies of high school interventions including the Career Academies Evaluation, the Evaluation of the Talent Development Middle and High School Models, the Enhanced Reading Opportunities Study, and the Study of the Content Literacy Continuum. Dr. Kemple will serve as the co-PI for this study and be the principal contact for the US Department of Education with regard to the project. Dr. Kemple will be responsible for the overall administration of the project and provide methodological support.

See Appendix F for resumes of InnovateNYC leadership team and our evaluation partners.

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[i] Dee, T. (2007). Teachers and the gender gaps in student achievement. The Journal of Human Resources, XLII(3), 1-28.

[ii] ―Confronting the ‗new' American dilemma, Underrepresented Minorities in Engineering: A data-based look at diversity". National Action Council for Minorities in Engineering, 2006.

[iii] Joanne Weiss, ―The Innovation Mismatch: ‗Smart Capital' and Education Innovation," Harvard Business Review, March 31, 2011

[iv] J. Edler, ―Demand Polices for Innovation in EU CEE Countries," Manchester Business School Working Paper, Number 579, 2009

[v] Examples taken from Kim Smith and Julie Petersen, ―Steering Capital: Optimizing Financial Support for Innovation in Public Education," a white paper developed by Innovation For The Public Good and Bellwether Education Partners. April 2011

[vi] An Overview of the Defense Venture Catalyst Initiative. Official DeVenCI website: http://devenci.dtic.mil/pdf/Overview.pdf

[vii] Accelerating the Acquisistion and Implementation of New Technologies for Intellegince: The Report of the Independent Panel on the Central Intelligence Agency In-Q-Tel Venture. Business Executives for National Security. June 2001.