Promoting Student Engagement in Science, Technology, Engineering, and Math:

An Evaluation of the B.R.I.D.G.E.S. After-School Program

Evaluation Report

September 2012

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Executive Summary

This report includes interim findings from YSI's evaluation of Build, Research, Invent, Design, Grow and Explore through Science (BRIDGES) during the 2011-12 program year. The program is a collaboration between The New York City Housing Authority (NYCHA), the housing authorities in Bridgeport and New Haven, Connecticut, and the Salvadori Center, a not-for-profit educational organization that uses the principles of architecture and engineering to help students in schools and out-of-school time programs to master mathematics, science, arts, and the humanities. The BRIDGES program currently operates in community centers run by the New York City, Bridgeport, and New Haven housing authorities, and aims to use investigations of the built environment to introduce and reinforce STEM concepts and skills. Most of the participants in BRIDGES are residents of the public housing developments where these community centers are located. The program highlights engineering concepts and the design process through hands-on investigations of the built environment with an emphasis on collaborative learning. It is taught by Salvadori Educators in partnership with the participating community centers. The target population consists of children ages 8-12 enrolled in after-school programs run by the New York City Housing Authority and housing authorities in Bridgeport and New Haven, Connecticut.

During the 2011-2012 school year, Youth Studies, Inc. administered pre- and post-surveys for during the Winter program cycle when the Salvadori Center was implementing its *Engineering Cities* module. A total of 5 observations were conducted at the following sites: Brevoort, Beach 41, Rutgers, Williamsburg, and Manhattanville. Observed sessions lasted from an hour to an hour and a half long, and there were 7-15 students involved in the sessions. A YSI evaluator also attended the *Engineering Cities* training, and a focus group for instructional staff was conducted at the conclusion of the *Bridges* module. Three student focus groups were conducted at the end of the *Bridges* module. Finally, an in-house observation protocol based on the CLASS Observation System was created by Youth Studies, Inc (see Appendix A). Two trainings for staff members and two site visits with the BRIDGES Program Manager were conducted during the spring program cycle.

The following are key highlights from Year 5 of the BRIDGES initiative:

- Students were actively engaged in engineering, urban planning, architectural, and environmental science concepts through hands-on activities.
- Surveyed participants experienced significant gains in their general engagement and interest in STEM as measured by a prominent standardized scale measure of student attitudes towards mathematics and science (see Page 12).
- Surveyed participants experienced significant gains in their perception of mathematics and science as useful subjects (see Page 13).
- Surveyed participants also experienced significant gains in their knowledge of basic urban planning terminology and concepts (see Page 14).

- A large majority of surveyed participants responded that the BRIDGES program helped them "learn about developing plans for solving a problem," and "learn about how building and structures are built" (see Page 15).
- Students planned and built a city based on the needs of a community, a budget, and their own creativity in the *Engineering Cities* module.
- Students tested and built different types of bridges in the *Bridges* module.
- Some of the students that had experienced multiple modules were eager to share their STEM knowledge as well as their interest in learning more about becoming architects or engineers.
- Based on feedback from Salvadori Educators, the program successfully supports student learning and engagement for students that would not normally have access to STEM enrichment programs.

During the 2011-12 program year, The Salvadori Center implemented the following modifications to the BRIDGES program. Several of these changes were implemented in response to evaluation findings reported by YSI in its 2010-11 BRIDGES evaluation report.

- The Salvadori Center has implemented a new staff evaluation and professional development process that provides comprehensive feedback to Educators based on observation data collected by the BRIDGES Program Manager. The staff feedback process involves conducting structured observations using an instructor quality framework that has been adapted from the Classroom Assessment Scoring System, also known as the CLASS protocol (Hamre, Pianta, Mashburn, & Downer, 2007).
- The Salvadori Center has begun a process of revising and updating its various curricula used by the BRIDGES program and several of its other school-based programs. Eventually, all of the curriculum modules used in the BRIDGES program will be revised and expanded.
    - The *Skyscrapers* curriculum was the first BRIDGES curriculum to be rewritten and it will be used in Fall 2012. The *Skateparks* curriculum is the next curriculum to be expanded and rewritten and it will be implemented during the Spring 2013 BRIDGES program cycle.
- BRIDGES Educators attended multiple training and professional development workshops to support the implementation of the curricula as well as learn about the CLASS observation protocol.
- The Salvadori Center has launched a new a 2-tier instructor model for Year 6 of the BRIDGES program. Assistants will be paired with experienced Salvadori Educators before they are assigned responsibility for leading their own program. This change has the additional benefit of increasing instructional support for students and providing additional classroom management.
- The Salvadori Center has hired a new Education Director who is providing additional support to the BRIDGES Program Manager.

Background

A challenge facing many educational institutions, especially those in urban settings serving culturally and linguistically diverse populations, is the disconnect that often exists between schools and students' home communities. Science education researchers have argued that this disconnect between school and home/community life may result in students feeling that science is impractical, alien, and in contradiction with the beliefs and practices of their lives (Basu & Barton, 2007). Urban and low-income students, in particular, are more likely to hold negative sentiments about science, such as boredom, anxiety, confusion, and frustration. Bouillion and Gomez (2001) have argued that this decoupling leads to a disengagement in which some learners fail to see schooling as an avenue for life progress. With respect to science education, this phenomenon jeopardizes our nation's goal to become first in the world in science achievement among students (U.S. Department of Education, 1991).

In response to this challenge, many are advocating an instructional approach that emphasizes hands on activities and learning by doing. In fact, many of the recent national reports on the conditions of science teaching and learning in schools call for, "More active learning for students and less passivity; more hands-on, direct opportunities to 'make meaning'" (Schmieder & Michael-Dyer, 1991). To that end, science education standards set forth by the American Association for the Advancement of Science and the National Research Council now urge less emphasis on memorizing decontextualized scientific facts and more emphasis on students investigating the everyday world and developing deep understanding from their inquiries (Marx et al., 2004). These approaches to instruction challenge educators to transform students' experiences in science classrooms. For teachers who are used to using instructional methods based on recitation and direct instruction, inquiry teaching challenges them to develop new content knowledge and pedagogical techniques (Basu & Barton, 2007; Bouillion & Gomez, 2001).

This report includes interim findings from YSI's evaluation of Year 5 of Build, Research, Invent, Design, Grow and Explore through Science (BRIDGES), an effort to engage disadvantaged students in an activity-based, science-oriented, after-school program. The program is a collaboration between the housing authorities in New York City, Bridgeport, and New Haven, Connecticut, and the Salvadori Center, a not-for-profit educational organization that uses the principles of architecture and engineering to help students in schools and out-of-school time programs to master mathematics, science, arts, and the humanities. BRIDGES is an after-school program that operates in 25 community centers run by the New York City Housing Authority (NYCHA) and, as of the 2011-12 program year, has expanded to two additional community centers in Bridgeport and New Haven, Connecticut. The BRIDGES program aims to use investigations of the built environment to introduce and reinforce STEM concepts and skills. Most of the participants in BRIDGES are residents of the public housing developments where these community centers are located. The program highlights engineering concepts and the design process through hands-on investigations of the built environment with an emphasis on

collaborative learning. It is taught by Salvadori Educators in partnership with the community centers. The target population consists of children ages 8-12 enrolled in after-school programs run by the New York City Housing Authority and housing authorities in Bridgeport and New Haven, Connecticut.

The rest of this report summarizes current findings from a comprehensive evaluation of BRIDGES that is currently being implemented by Youth Studies, Inc. (YSI), an evaluation firm that provides research and program evaluation services to a variety of youth-serving organizations, including schools and community-based youth programs. These findings reflect data collected during Year 5 of a six-year initiative, which took place during the 2011-12 school year.

Description of Evaluation Process

Participant Surveys

YSI administered pre- and post-participation student surveys in October 2011 and January 2012 at participating NYCHA programs. Questionnaire items included measures of **a) students' engagement and interest in math and science, b) students' self-efficacy in performing math and science, and c) students' core knowledge and skills in areas addressed by the BRIDGES *Engineering Cities* curriculum**.

To assess how BRIDGES participants' attitudes about math and science may have changed over the course of the first year of the initiative, YSI evaluators included survey items from the Fennema-Sherman Attitudes Scale, a math and science attitude scale that has been used extensively in education research. Using students' responses to questions from the Fennema-Sherman Attitudes scale, we constructed measures of students' personal *confidence* in their ability to do math and science and the degree to which they believe math and science are *useful* subjects. These attitudes were assessed prior to and after students participated in the BRIDGES program. More specifically, students were asked in both pre- and post-test surveys to agree or disagree with the following statements related to these attitudes. Students' responses to similar statements were averaged to form measures of students' confidence in math and science and their belief in how "useful" these subjects are.

Table 1. Modified Fennema-Sherman Attitude Scales

Confidence Items	Usefulness Items
Math is hard for me	Knowing math will help me find a good job when I am older
Science is hard for me	Knowing science will help me find a good job when I am older
I know I can do well in math	I expect to use a lot of math and science when I get out of school
I know I can do well in science	Math and science will be important to me in my future
I am sure I can learn math	
I am sure I can learn science	
I think I could do advanced math and science	

Moreover, three survey items from the Programme for International Student Assessment (PISA) were included to assess students' future-oriented motivation to pursue science education and careers (OECD, 2007). Those items are listed in Table 2.

Table 2. PISA Future-Oriented Science Motivation Scale

Future-Orientated Science Motivation
I would like to work in a career involving science.
I would like to study science after secondary school.
I would like to work on science projects as an adult.

To assess changes in participants' knowledge of basic urban planning terminology and concepts, participant surveys included a set of 11 "content" items that were drawn directly from the BRIDGES *Engineering Cities* curriculum. A copy of the survey instrument is included as Appendix B. The urban planning content items are found in questions 34 through 44. Students' responses to these content questions were averaged to create a "Knowledge of Urban Planning Concepts" scale. Possible values for this scale ranged from 0 (indicating 0 correct responses) to 100 (indicating that the students answered all 11 questions correctly).

Observations and focus group

A YSI Evaluator conducted 5 site visits to NYCHA programs implementing the *Engineering Cities* curriculum. The purpose of the visits was to assess the quality of BRIDGES activities. The NYCHA centers that were visited by YSI evaluators included: Brevoort, Beach 41, Rutgers, Williamsburg, and Manhattanville. Observed sessions lasted from an hour to an hour and a half long, and there were 7-15 students in attendance. An YSI staff member also visited the *Engineering Cities* and *Bridges* training sessions. YSI also conducted two training sessions on the CLASS observation protocol as well as one Educator focus group and three student focus groups following the *Bridges* module.

Table 3. BRIDGES Programs Observed by YSI Evaluators

Site	Number of Students
Brevoort	7 (*6 girls and 1 boys*)
Beach 41	7 (*1 girls and 6 boys*)
Rutgers	15 (*7 girls and 8 boy*)
Williamsburg	11 (*0 girls and 11 boys*)
Manhattanville	8 (*4 girls and 4 boys*)

Implementation Findings

Enrollment and Attendance

Enrollment in the BRIDGES programs observed by YSI evaluators ranged between 7 and 15 students per program. The majority of the students were present at the beginning of the sessions, but there were some instances in which students walked in late, left and returned during the course of the observation, or left before the end of the session. Issues with irregular attendance have been observed at NYCHA facilities during prior evaluation years. Given that the Housing Authorities are ultimately responsible for setting attendance and lateness policies, there is little that the Salvadori Center itself can do to ensure that students are present at the beginning of BRIDGES lessons and that they are not pulled out during the session.

Educator Focus Group

The following themes emerged from a focus group with participating BRIDGES Educators that was facilitated at the end of the 2011-2012-program year. Eight Educators met with a YSI evaluator to discuss their experiences with both the *Engineering Cities* and *Bridges* program cycles. [See pages 17-18 to see how this feedback is being addressed.]

- The Educators felt that the professional development pieces of the program were beneficial and supportive. They would like to see an additional training on each curriculum to support their instruction. It was suggested that halfway through the module would be a good time to hold a second training session.
- The Educators felt that the key concepts gleaned from the *Engineering Cities* curriculum were recycling, how to map a built environment, blueprints, and some geography.
- The Educators felt that the key concepts gleaned from the *Bridges* curriculum were that there are different types of bridges, tension and compression, and identification of different parts of a bridge.
- All of the Educators felt that having a NYCHA staffmember in the classroom was integral to the program's success, and there were many anecdotes about how these staffmembers helped to bridge the cultural gap between students and educators as well as provided classroom management support.

- The Educators felt that some of the content of the *Engineering Cities* curriculum was weak due to its lack of cohesiveness, hands-on activities, and content support for students. On the other hand, they were encouraged by the direction the organization has taken in revising and expanding all of its core curricula.
- Many of the Educators changed the written curriculum of both modules, and at least one instructor did not follow the *Engineering Cities* curriculum after the third week. The changes to the curriculum were to make activities easier, more engaging, or more content focused.
- One of the largest challenges for Educators was setting up the sites (where to store supplies, who to contact at the center with issues and concerns, lack of packing lists for materials, etc.)
- The Educators felt that classroom management training and differentiation professional development would support their work.
- Educators felt that the templates for some of the activities were difficult to use for some of the students due to their lack of fine motor skills and age.
- The Educators felt that the weekly reports would be more supportive if they received feedback from administrative staff.
- Educators felt that the CLASS observation protocol was helpful because it provided insight on their instructional style.
- Students enjoyed testing and experimentation, as well as some of the building projects.
- Educators felt that center directors and staff were key to program success as those that were supportive of the program provided classroom management support as well as helped to foster student engagement.
- Educators felt that center staff members that were not supportive were impediments to the program as they would at times come into the classrooms and yell at students, pull them out of the program, and schedule other programs at the same time as BRIDGES.

Student Focus Groups

Three focus groups were held with students from Lehman Village, Manhattanville, and Brevoort at the end of the *Bridges* module. Five to six students were selected and they were asked questions about their experiences in the program along with some content questions about the *Bridges* curriculum. The following themes emerged from the student focus groups.

- Students enjoyed making their individual bridges at the end of the program.
- Student felt like the planning time before constructing their bridges was important to their success.
- Some of the students expressed interest in becoming an architect after participating in the BRIDGES program.

- Students found some of the materials to be challenging and were discouraged when projects did not work correctly.
- Students enjoyed testing the different bridges.
- Students were unable to identify the role of the Salvadori Center in the BRIDGES program.
- Students were able to name Arch, Suspension, and Truss bridges.
- Students were able to identify landmark bridges that were both in and out of NYC.
- During a performance task where students were asked to draw and name a type of bridge, many of the students were able to draw a bridge including a span and supports, but the majority of the students were unable to correctly name the type of bridge they had drawn.
- When asked what they think the goal of the *Bridges* module was, students answered to
    - learn about different types of bridges.
    - teach them about the different parts of bridges.
    - support them if they want to be architects.
- When asked how BRIDGES was different than their normal school day, they said
    - it covered different topics like bridges and math concepts.
    - was more hands on.
    - the Educators were sometimes nicer and more supportive.

Training

The BRIDGES Educators received trainings on both the two curricula for the 2011-2012 school year and the new CLASS observation protocol. Salvadori Staff trainings for each of the *Engineering Cities* and *Bridges* curricula occurred over a 2-day period, during which the Educators went over all of the key activities and the final projects of the curricula. The CLASS observation protocol training was conducted by YSI staff and introduced the Educators to the system as well as gave the Educators the opportunity to practice using the protocol on sample instructional videos. The Salvadori Center has written a detailed curriculum guide to ease training and instruction for the 2012-2013 school year.

Curriculum

The Salvadori Center determined that key for the 5th year of the grant was the revision of the existing BRIDGES curricula for the 6th year of the grant. Using recommendations from previous YSI reports and the knowledge and experience of the Salvadori staff, the Skyscrapers curriculum was revised in the spring of 2012 in partnership with YSI. The first step of the revision was the mapping of the existing curriculum to the national Common Core Math Standards and the NYS Standards for Mathematics, Science, and Technology. This supported a determination of the key objectives for the curriculum, which supported the following revisions being made to the *Skyscrapers* curriculum.

- Inclusion of a student agreement (behavior contract).
- Inclusion of a curriculum overview that describes the subject matter, timing, materials, and objectives for Educators as well as those interested in the curriculum (board members, funders, etc.).
- Inclusion of Educator support sections that include important content knowledge, key concepts, and teaching tips for the activity.
- Inclusion of a structured Educator preparation section before each lesson that includes material preparation and room set-up.
- Inclusion of teaching tips where appropriate in the curriculum to support questions that students may have as well as important instructional strategies.
- Inclusion of scaffolding for discussions, key questions for students, extensions, and differentiation when appropriate.
- Integration of literacy into the existing curriculum by creating a student booklet that includes writing exercises, a glossary, reading passages, and all student worksheets.
- Integration of math concepts into the curriculum by having students measure, perform data analysis, and use formulas when applicable and supportive of the curriculum.
- Strengthening of planning support for the final projects in the curriculum by creating highly structured and scaffolded pre-activities and planning supports.

Participant Outcome Findings

BRIDGES participants were surveyed at the beginning and conclusion of the 12-week Winter program cycle during the 2011-12 school year. During this cycle, the Salvadori Center carried out the *Engineering Cities* curricula, which introduces students to urban-planning practices and methods used by professionals. Students worked in teams to design and model a built community in a location currently uninhabitable by humans.

In addition to basic background questions (e.g. gender, age, and ethnicity), the pre- and post-assessments included standardized measures of: 1) **general engagement and interest in math and science**; two measures of students' attitudes towards math and science, including 2) **personal confidence in one's ability to succeed in math and science**, and 3) **belief that math and science are *useful* subjects**; and 4) students' **future-oriented motivation to pursue math and science careers and education**. (See *Description of Evaluation Process* above for more information about the BRIDGES survey.)

Background Characteristics

As seen in Table 4, the majority of surveyed students were in Grades 3rd through 5th (ages 8-12) (72%). There were 188 respondents who completed the pre-test assessment and 83 participants who completed the follow-up assessment. Fifty-nine percent of participants were female, and 84 percent of surveyed participants self-identified as Black or Hispanic/Latino.

Table 4. Background Characteristics of BRIDGES Participants

Background Characteristic	Percent
Grade	
1st	<1
2nd	1
3rd	16
4th	26
5th	32
6th	14
7th	9
Gender	
Female	59
Male	41
Ethnicity (categories are not mutually exclusive)	
Hispanic/Latino (of any race)	32
American Indian or Alaska native	3
Asian	9
Black or African-American	52
White	11
Other	20

Engagement and Interest in Math and Science

To measure students' engagement and interest in math and science, the BRIDGES survey included 9 Likert-type items, including "I have fun when I am learning science topics," and "I like to experiment with gadgets," among others. As seen in Table 5 below, BRIDGES participants reported a moderate improvement in their general engagement and interest in math science. However, the difference in average math and science engagement between pre-test and post-test assessments (a positive change of .48) was found to be statistically significant. A paired-samples t-test was conducted to compare students' mathematics and science engagement score as measured at the beginning of the BRIDGES program and after the *Engineering Cities* program completed. There was a significant difference in pre-test vs. post-test conditions ($M_{difference}$=.48, SD=0.71); t (131.5)=3.872, p < .000.

Table 5. Pre- vs. Post-test Assessments of Student Engagement and Interest in Math and Science

	Math and Science Engagement
Mean (range 1-4)	
Pre-test Score	2.60
Post-test Score	3.08
Change	+ 0.48#

Change score is statistically significant (t-difference=3.87, p<001.

Students' Attitudes Toward Math and Science

To assess how BRIDGES students' attitudes about math and science may have changed during the year they participated in the program, evaluators administered a modified version of the Fennema-Sherman Attitudes Scale (see description above). Two attitudinal measures were constructed: 1) a measure of students' personal *confidence* in their ability to do math and science, and 2) the degree to which they believe math and science are *useful* subjects. These attitudes were assessed prior to and after students participated in BRIDGES.

As seen in Table 6 below, BRIDGES students, on average, demonstrated small improvements in math and science attitudes as measured before and after their participation in the BRIDGES program. This included a small improvement in average confidence in participants' math and science abilities, and a moderate increase in participants' average rating of math and science as useful and relevant subjects.

A paired-samples t-test was conducted to compare students' math and science confidence as measured at the beginning of the BRIDGES program and after the *Engineering Cities* program completed. There was a non-significant improvement in pre-test vs. post-test conditions (Difference=.15, SD=0.62); t (140.5)=1.343, p = .09. Moreover, a paired-samples t-test was conducted to compare students' belief in math and science as useful subjects as measured at the beginning of the BRIDGES program and after the *Engineering Cities* module was completed. There was a significant improvement in pre-test vs. post-test conditions ($M_{difference}$=.28, SD=0.72); t (119.8)=2.323, p = .01.

Table 6. Pre- vs. Post-test Assessments of Students' Math and Science Attitudes

	Math and Science Attitudes ***Confidence***	**Math and Science Attitudes** ***Usefulness***
Mean (range 1-4)		
Pre-test Score	3.09	2.94
Post-test Score	3.23	3.22
Change	+ 0.15#	+ 0.28%

Change was not found to be statistically significant.
% Change was found to be statistically significant.

Students' Future-Oriented Motivation Toward Math and Science

The BRIDGES participant survey included three items to measure students' motivation to pursue future education and careers in math and science. As seen in Table 7 below, BRIDGES participants demonstrated a significant increase in motivation to pursue educational and career choices in math and science. A paired-samples t-test was conducted to compare students' future-oriented motivation to pursue math and science as measured at the beginning of the BRIDGES program and after the *Engineering Cities* module was completed. There was a significant improvement in pre-test vs. post-test conditions ($M_{difference}$=.35, SD=1.00); t (152)=2.198, p = .015.

Table 7. Pre- vs. Post-test Assessments of Students' Future-Oriented Science Motivation

	Math and Science Motivation
Mean (range 1-4)	
Pre-test Score	2.69
Post-test Score	3.04
Change	+ 0.35[#]

[#] Statistically significant change from baseline to follow-up (p<.00)

Students' Knowledge of Basic Urban Planning Concepts and Definitions

The BRIDGES participant survey included 11 items measuring students' knowledge of basic urban planning definitions and concepts. These items were scored and a "Knowledge of Urban Planning Concepts" scale was created to measure the proportion of those 11 questions that a student answered correctly. Possible values for this measure ranged from 0 (indicating 0 correct responses) to 100 (indicating that the students answered all 11 questions correctly).

As seen in Table 8 below, BRIDGES participants demonstrated a significant increase in their knowledge of these basic urban planning concepts. A paired-samples t-test was conducted to compare students' urban planning knowledge at the beginning of the BRIDGES program and after the *Engineering Cities* module was completed. There was a significant improvement in pre-test vs. post-test conditions ($M_{difference}$=20.01, SD=26.9); t (132.9)=4.928, p < .000.

Table 8. Pre- vs. Post-test Assessments of Students' Knowledge of Urban Planning Concepts

	Urban Planning Knowledge
Mean (range 0-100)	
Pre-test Score	48.04
Post-test Score	68.05
Change	+ 20.01[#]

[#] Statistically significant change from baseline to follow-up (p<.00)

Participant Attitudes Towards the BRIDGES Program

Finally, the post-test survey administered by YSI included a series of questions that asked students specifically about their experiences in the BRIDGES program. They included:

Table 9. Participant Feedback on the Salvadori Program

"The following questions ask about the BRIDGES program. For each question, answer whether the following things happened when you participated in the BRIDGES program."

	% Agree
I tried doing new things.	89
I did things here I don't get to do anywhere else.	62
I set goals for myself in this activity.	80
I learned to find ways to achieve my goals.	83
I learned about developing plans for solving a problem.	89
I used my imagination to solve a problem.	85
I learned to consider possible obstacles when making plans.	75
I put all my energy into the activity.	82
I focused my attention on the activity.	89
I learned how to use tools like a ruler, t-square, and templates.	74
I learned about how buildings and structures are built.	87
I learned how to measure things.	82
I practiced drawing and sketching.	80
I learned what architects and engineers do.	73

Recommendations

Based on these interim findings, YSI recommends taking the following steps. **[NOTE: The recommendations printed in italics have been implemented for the Fall 2012 program cycle.]**

- **Training**
    - Provide two training sessions for the Educators: once prior to the start of the module and a second time at a middle point of the module. This second training session will provide additional support for Educators, refresh knowledge of the curriculum, and provide a time for Educators to give feedback as a group.
    - *Expand the training to include workshops on classroom management, questioning techniques, problem solving, differentiation, and STEM topics.*
    - Ask Educators to teach different sections of the curriculum and have the other Educators provide constructive feedback.
    - *Host an open house for NYCHA site directors that includes information about the program, what is expected of the sites, and demonstrates different aspects of the program.*
- **Support for Educators**
    - Set instructional goals for each of the sites and Educators based on previous experiences at the sites and/or needs for new sites.
    - *Provide feedback on weekly reports as they are collected.*
    - Set up a forum for Educators to be able to share best practices (i.e. a Google group).
    - *Organize materials in a way so as to limit disorganization on the part of the Educators. This can be done by creating session specific folders/packets as well as insuring that there are enough extra copies of materials in case of need for review or greater enrollment.*
- **NYCHA Specific Recommendations**
    - Request for site directors to provide a room that can be used for the duration of the program, so that student work can be displayed. This would also support a sense of continuity and a space that would facilitate student learning.[#]
    - Ask sites to provide storage space for the BRIDGES materials.[#]

[#] The Salvadori Center has requested these changes from the New York City Housing Authority.

- Ask sites to ensure that if a co-teacher is to be made available from the center staff, they should be engaged with the session and are not to be asked to do something else during that time or to walk in and out of the classroom.
- Ask sites to not schedule major activities at the same time that BRIDGES is set to run so as to limit student disengagement due to desire to attend another program.

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Appendix A: BRIDGES Staff Observation Protocol

Appendix B: Bridges Participant Survey

Salvadori Center - BRIDGES Youth Survey (Urban Planning)

Youth Studies, Inc.

FIRST NAME (Print in boxes) **LAST NAME**

NYCHA Site

Dear After-School Participant:

We are asking students to fill out this survey to help us improve the after-school program. If you are uncomfortable answering a question, you may leave it blank. This is not a test! There are no right or wrong answers. Thank you for your help!

1. Are you… ❑$_0$ Male (a boy) ❑$_1$ Female (a girl)

2. What grade are you in? *[Check only one box.]*

❑$_0$	Kindergarten	❑$_3$	3rd grade	❑$_6$	6th grade
❑$_1$	1st grade	❑$_4$	4th grade	❑$_7$	7th grade
❑$_2$	2nd grade	❑$_5$	5th grade	❑$_8$	8th grade

3. What is your ethnicity? *[Please check all that apply.]*

❑$_1$	White	❑$_3$	Native American	❑$_5$	Hispanic/Latino
❑$_2$	Black	❑$_4$	Asian or Pacific Islander	❑$_6$	Other: _____

Please circle the number that shows how you feel about each of the following statements.

	Strongly Agree	Agree	Disagree	Strongly Disagree
4. I have fun when I am learning science topics	1	2	3	4
5. I am sure I can learn math	1	2	3	4
6. I know I can do well in science	1	2	3	4
7. I like to experiment with gadgets	1	2	3	4
8. Science is important for helping us to understand the world	1	2	3	4
9. I would like to listen to engineers and other scientists talk about their jobs	1	2	3	4
10. I think I could do advanced math and science	1	2	3	4
11. When I leave school, I would like to work with people who make discoveries in science	1	2	3	4
12. Science is useful in helping to solve the problems of everyday life	1	2	3	4
13. I expect to use a lot of math and science when I get out of school	1	2	3	4
14. Knowing math will help me find a good job when I am older	1	2	3	4
15. Science lessons are fun	1	2	3	4
16. It is boring to learn new science words	1	2	3	4
17. Math is hard for me	1	2	3	4
18. Math and science will be important to me in my future	1	2	3	4
19. I am interested in learning about science	1	2	3	4

20. I know I can do well in math	1	2	3	4
21. I would like to work in a career involving science	1	2	3	4
22. I like to measure things to see how big they are	1	2	3	4
23. I would like to study science when I go to college	1	2	3	4
24. Knowing science will help me find a good job when I am older	1	2	3	4

Please circle the number that shows how you feel about each of the following statements.

	Strongly Agree	Agree	Disagree	Strongly Disagree
25. Science is hard for me	1	2	3	4
26. A job as an engineer or scientist would be interesting	1	2	3	4
27. I would like to work on science projects as an adult	1	2	3	4
28. I am sure I can learn science	1	2	3	4

How well do you know how to use the following tools?

	Very Well	Pretty Well	Not Well	I don't know how to use this tool	I don't know what this is
29. Ruler	1	2	3	4	5
30. T-square	1	2	3	4	5
31. Protractor	1	2	3	4	5
32. Scissors	1	2	3	4	5
33. Templates	1	2	3	4	5

34. Organic architecture means that the building or structure …

- ❑$_1$ is healthy for you.
- ❑$_2$ fits into the natural surroundings.
- ❑$_3$ is a good place to buy groceries.
- ❑$_4$ is made of recyclable materials.

35. Which of these is not a type of transportation infrastructure?

- ❑$_1$ A road
- ❑$_2$ An airport
- ❑$_3$ A bicycle
- ❑$_4$ The subway

36. Which is the strongest shape for a tunnel?

- ❑$_1$ A circle
- ❑$_2$ A square
- ❑$_3$ A triangle
- ❑$_4$ A prism
- ❑$_5$ I don't know

37. Fossil fuels are examples of

- ❑$_1$ Renewable energy sources
- ❑$_2$ Green technology
- ❑$_3$ Non-renewable energy sources
- ❑$_4$ Global warming

38. Carbon dioxide and water vapor are examples of

- ❑1 Global Warming
- ❑2 Solids
- ❑3 Poison
- ❑4 Greenhouse gases

39. The ability to do work is called

- ❑1 Running
- ❑2 Energy
- ❑3 Force
- ❑4 Eating

40. Waste, or garbage, is often disposed by

- ❑1 Dumping it in a landfill
- ❑2 Composting
- ❑3 Recycling
- ❑4 All of the above

41. Urban planners

- ❑1 Figure out the best way to use the land in cities and neighborhoods
- ❑2 Design buildings and supervise their construction
- ❑3 Analyze and design structures
- ❑4 None of the above
- ❑5 All of the above

42. A community

- ❑1 A two-dimensional diagram
- ❑2 The area surrounding a large city
- ❑3 A blueprint
- ❑4 A group of people with a common characteristic

43. A skyline is

- ❑1 The artificial horizon that a city's overall structure creates
- ❑2 A blueprint for a skyscraper
- ❑3 A system of transportation in a city
- ❑4 A term used only for NYC’s buildings

44. A utopia is

- ❑1 An imperfect place
- ❑2 A perfect place
- ❑3 A landfill
- ❑4 A type of bridge

THANK YOU!

If you participated in the BRIDGES program, please complete questions 38-51. If you are NOT a participant in the BRIDGES program, you have completed the survey and should hand it in to your instructor. Thank you for your help!

The following questions ask about the BRIDGES program. For each question, answer whether the following things happened when you participated in the BRIDGES program.

	No way	Not really	Sort of	Yes
45. I tried doing new things.	1	2	3	4
46. I did things here I don't get to do anywhere else.	1	2	3	4
47. I set goals for myself in this activity.	1	2	3	4
48. I learned to find ways to achieve my goals.	1	2	3	4
49. I learned about developing plans for solving a problem.	1	2	3	4
50. I used my imagination to solve a problem.	1	2	3	4
51. I learned to consider possible obstacles when making plans.	1	2	3	4
52. I put all my energy into the activity.	1	2	3	4
53. I focused my attention on the activity.	1	2	3	4
54. I learned how to use tools like a ruler, t-square, and templates.	1	2	3	4
55. I learned about how buildings and structures are built.	1	2	3	4
56. I learned how to measure things.	1	2	3	4
57. I practiced drawing and sketching.	1	2	3	4
58. I learned what architects and engineers do.	1	2	3	4

THANK YOU!