

# School of One Evaluation – 2010 Spring Afterschool and Short-Term In-School Pilot Programs

## Executive Summary

The New York City Department of Education's Research and Policy Support Group (RPSG) was contracted to conduct an evaluation of the second pilot phase of the School of One (So1) program. School of One is an educational model that leverages technology to individualize student learning. While previous preliminary evaluations demonstrated the effectiveness of the model when implemented in a summer school setting, the current evaluation extended and built upon this finding in two key ways: (1) by examining the effectiveness of the model when applied in an afterschool setting as well as in a (short-term) in-school setting, and (2) by including a comparison group in the analyses (which the previous evaluation lacked). Data collected across three schools from students who participated in the program was compared to data from students within the same three schools who did not participate in the program (the comparison group). The evaluation assessed both student math achievement gains as well as students' and teachers' opinions of the So1 program.

## Key Findings

### Student Achievement

- Students who participated in So1 showed significantly larger gains in academic achievement (on NWEA's Measures of Academic Progress [MAP] test of Math achievement) than their peers following participation in the program.
  - Following the after-school implementation of So1, participating students' MAP scores increased significantly more than did the scores of non-So1 students within the same schools. Analysis of students by pre-So1 performance quartile revealed gains at all achievement levels.
  - Following the in-school implementation of So1, participating students showed positive gains which were significantly greater than those who did not continue to participate in So1 (who saw their scores decline). The largest gains were for students who participated in both the afterschool and in-school So1 programs.

### Student Opinions

- Participating students had favorable attitudes towards the So1 program.
  - Students most enjoyed earning points (as part of a motivational game that put them on teams to create a sense of community), learning from an online teacher live, and working with other students.
  - Students showed less favorable attitudes towards taking daily assessments and working by themselves on worksheets.
  - The majority of students were enthusiastic about the potential to have the So1 program in their regular math classroom.

### Teacher Opinions

- So1 teachers showed generally favorable attitudes towards the program.
  - Teachers felt the program both helped them learn new approaches to teaching math that they plan to use again and increased their ability to help students learn.
  - Teachers agreed that So1 was effective at supporting both high and low performing students.
  - Some teachers commented that the program did not address the needs of certain at-risk populations (ELLs/SPED) as adequately as other math programs they have used in the past.

## Introduction

The School of One (So1) is an educational model that leverages technology to individualize student learning. The mission of So1 is to “provide students with personalized, effective, and dynamic classroom instruction and, by leveraging technology to streamline planning instruction, allow teachers to have more time to focus on the quality of their instruction.” To achieve this mission, the So1 model involves an alternative arrangement of space and human resources to that typically found in a traditional classroom. Instead of one teacher and 25-30 students in a classroom, each student participates in multiple instructional modalities, including a combination of teacher-led instruction, one-on-one tutoring, independent learning, and work with virtual tutors.

To organize this type of learning, each student receives a unique daily schedule based on his or her academic strengths and needs. As a result, students within the same school or even the same classroom can receive substantially different instruction as each student’s schedule is tailored to the skills they need and the ways they best learn. Teachers acquire data about student achievement each day, which they can then use to adapt their live instructional lessons accordingly.

The New York City Department of Education (NYCDOE) first examined the So1 model in a limited-scale pilot phase in the Summer of 2009 with 80 rising seventh graders in a summer school program in Manhattan’s Chinatown. Results from both a more formative assessment by the Center for Children and Technology of the Education Development Center (EDC/CCT, October 2009) as well as a more quantitative/summative assessment by NYCDOE’s Research and Policy Support Group (RPSG, March 2010), yielded promising, preliminary results suggesting that a more formal and systematic study was warranted. Results from these evaluations indicated that the model was feasible, students and educators had positive experiences with the program, and positive learning outcomes were found. However, as the study occurred in the context of a summer school program and lacked a control group, the current study sought to extend the findings and refine the evaluation model to account for these initial limitations.

The current evaluation of So1 continued to build on the previous evaluations by studying two new types of implementation that occurred in the Spring of 2010 -- an afterschool program with six hundred 6<sup>th</sup> grade students across three schools (one in Brooklyn, one in Manhattan’s Chinatown, and one in the Bronx) followed by a short-term, in-school implementation of the program with 6<sup>th</sup> grade students in one of the three schools. Two of these schools are classified by New York State as in need of improvement (See bottom of page for further school selection criteria).

## Evaluation Methodology

The primary research questions for the 2010 Spring Pilot Programs were:

- Do So1 students show changes in math achievement that differ from their peers?
- Do the effects of So1 on math achievement vary as a function of previous math ability?
- What are students’ opinions of the program? What are their key likes and dislikes?
- What is the perceived program impact of So1 on students according to instructional staff?

The math achievement of 6<sup>th</sup> grade students in these schools was evaluated with an assessment tool known as the Measures of Academic Progress (MAP). The MAP is a computerized adaptive assessment constructed by the Northwest Evaluation Association (NWEA) that is aligned to state standards and produces a score independent of grade and age. The MAP then provides norm-referenced scores for grade-level comparisons. Scores are presented in Rasch Units referred to as ‘RIT’ scores. The RIT scale is an equal-interval scale that is used to chart student’s academic growth (see: [http://www.nwea.org/about-nwea/faq/Measures%20of%20Academic%20Progress%20\(MAP\)#faq-192](http://www.nwea.org/about-nwea/faq/Measures%20of%20Academic%20Progress%20(MAP)#faq-192)). The test is untimed, but takes an average of 45-50 minutes to complete. Normative data from 2008 revealed that the average annual gain for a 6<sup>th</sup> grade student on the MAP is between 5.5 and 6 points ([http://www.nwea.org/sites/www.nwea.org/files/support\\_articles/Normative%20Data%20Sheet\\_v2.pdf](http://www.nwea.org/sites/www.nwea.org/files/support_articles/Normative%20Data%20Sheet_v2.pdf)). This assessment was used to establish student achievement levels throughout Spring 2010 in response to the two implementations of So1 which, in total, spanned approximately one quarter of a school year.

*Selection of Schools:* Several factors were used to determine site selection for the afterschool program, including:

- school leadership and staff commitment to piloting So1 model,
- schools with sufficient space to build out an So1 math center,
- schools with one laptop to every child and sufficient wireless capacity to ensure that virtual content would run smoothly, and
- schools large enough to allow for clustering students across the skill map with appropriate staffing ratios.

School of One selected one of the three schools to implement the in-school pilot based on the above criteria in addition to the school's double period schedule (88 minute periods), which allowed So1 sufficient time to provide students with two 35-minute lessons and administer daily assessments.

*After-school Implementation:* All 6<sup>th</sup> grade students at the three participating schools (referred to as Schools 1, 2, and 3) were offered the opportunity to participate in the So1 afterschool program. Students who opted to participate in the program were required to complete the February and May MAP assessments. Students at each of the three schools who chose not to participate in So1 (the comparison group) were able to opt-out of the evaluation assessments by returning a consent form (signed by a parent/guardian). For the purposes of assessing academic gains over time, changes in student MAP scores (from the first assessment to the second) were compared across two groups:

- students across three schools who participated in So1 afterschool, and
- students across the same three schools who did not participate in So1 afterschool.

At the end of the program (in May) students and instructional staff who participated in So1 were administered opinion surveys. Student surveys focused on student attitudes towards So1 and its various components. Instructional staff were asked questions regarding the impact of So1 on students, successes and challenges of So1 implementation, and their overall satisfaction with So1.

*In-school Implementation:* Following the conclusion of the afterschool program, *all* of the 6<sup>th</sup> grade students at one of the schools (School 1) participated in So1 during their in-school math instruction. Thus, starting at this time, So1 replaced their traditional math instruction. The other two schools (Schools 2 and 3) did not receive So1 during school, and thus served as the comparison group. Following the conclusion of the in-school program (in June), students at all three schools completed a third MAP assessment (although only students participating in the in-school program were *required* to complete the third assessment). Students who had participated in So1 in-school were also administered the So1 opinion survey. Instructional staff at the school that participated in So1 in-school were also given an opinion survey about the program (which was identical to the one previously administered to So1 afterschool instructional staff).

For the purposes of assessing academic gains over time, student gains in MAP scores (from the first assessment to the third) were compared across four groups:

- students who participated in So1 afterschool and then continued to participate in So1 in school,
- students who did not participate in So1 afterschool but then participated in So1 in school,
- students who participated in So1 afterschool but then did not participate in So1 in school, and
- students who did not participate in either the So1 afterschool program or So1 in school.

## Profile of Students

Before analyzing results from the study, it was important to document whether students who participated in the So1 program differed in any fundamental way from those who did not participate in the program.

*Special Education Status:* Participants at the three schools did not vary with respect to the proportion of students identified as special education students (5-7%).

*English Language Learner (ELL) Status:* The three schools varied with respect to the proportion of ELLs students in each (13-27%); however the proportion of ELLs within each school by So1 status did not differ significantly.

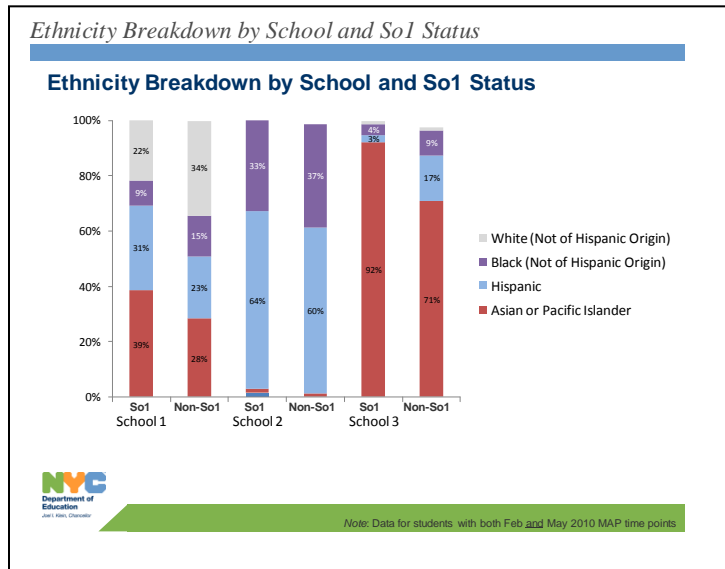
*Free/Reduced Lunch Status:* The three schools varied with respect to the proportion of students receiving free or reduced meals (82%-97%), although the proportion of students receiving free/reduced lunch within each school by So1 status did not differ significantly.

*Ethnicity:* The three schools varied with respect to student ethnicity:

- School 1 had an ethnically varied student population,
- School 2 had a predominantly Hispanic student population, and
- School 3 had a predominantly Asian population.

However, *within* each school, the proportion of So1 and Non-So1 students in each ethnic/racial category was fairly similar.

The only exception to this was at School 3 in which the proportion of students between the two groups was more variable than at Schools 1 or 2.



*Prior Academic Standing:* As students in the afterschool program self-selected whether they wanted to participate in So1, we also examined the incoming measures of academic performance to ensure that no fundamental differences in performance level existed between our treatment and control groups before the study.

While *across* schools there were differences in academic performance (as measured by incoming February MAP RIT scores and results on the 2009 NY State Math and English Language Arts [ELA] tests), *within* each school there were no significant differences on these measures between students who chose to participate in So1 and those who chose not to participate.

	School					
	School 1		School 2		School 3	
	So1	Non-So1	So1	Non-So1	So1	Non-So1
MAP Test Feb 2010 RIT Score	224.8	221.6	210.0	210.5	224.7	220.4
Math Scale Score	697	689	674	671	704	696
ELA Scale Score	675	671	659	655	669	667

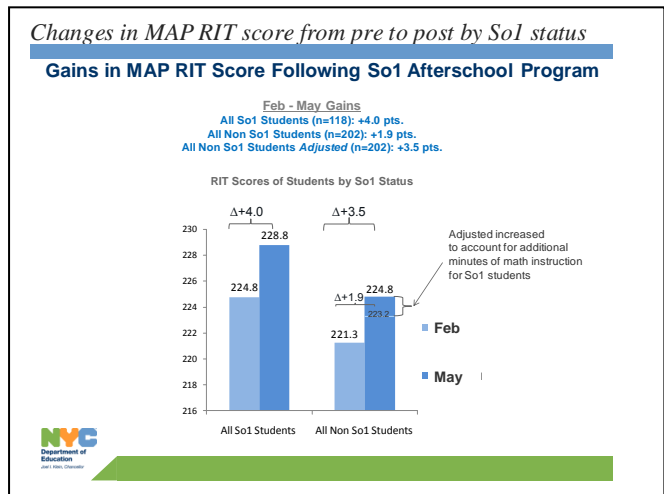
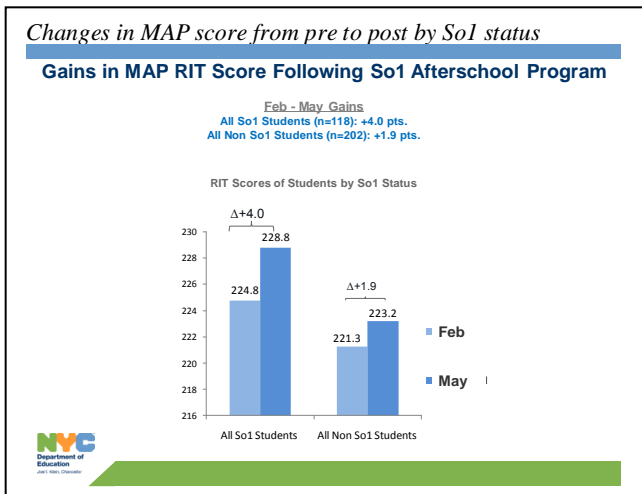
### Data Analysis

Specific criteria were put in place regarding whether data from students would be included in the final analyses. While the initial sample consisted of 602 sixth grade students, final analyses included 320 students (53.2%). The following students were excluded from the final analyses:

- *Students who did not complete the MAP assessment at all relevant time points (Feb and May for afterschool analyses, Feb, May, & June for in-school analyses)*
  - This rule was put into place to ensure a true pre-post design, whereby students’ scores before participation in the program were directly linked to their scores after participation in the program.
- *Students who displayed outlying changes in MAP scores that were indicative of non-engagement at one time point relative to the other.*
  - Recommendations from NWEA (<http://www.nwea.org/support/article/554>) state that *students who have an 11-point decline (termed negative growth) in their RIT score should be considered for re-testing*. It is believed that such drastic drops occur when students are not engaged in the task/do not spend enough time during the second administration. As such, students with such drastic drops were excluded from the final analysis.
  - While NWEA’s above recommendation leads to the exclusion of students who were engaged at Time 1 but not at Time 2, it does not account for the opposite occurrence -- whereby a student may not be engaged at the first administration, yet engaged during future administrations (resulting in extremely large *increases* in MAP scores that may not be a direct result of the program). To counter bias in this direction, analyses excluded students who were in the bottom 5<sup>th</sup> percentile at any time point.
- *Students with less than 70% attendance rate in the afterschool program (for those participating)*
  - This rule was put into place to ensure that students included in the analyses were only those who actually attended the program a substantial portion of the time. The level of 70% was set as a goal for ideal participation in the afterschool setting. Attendance in afterschool programs is generally lower than in-school participation. Setting this bar any higher would have decreased the sample size too substantially to conduct meaningful statistical analyses.

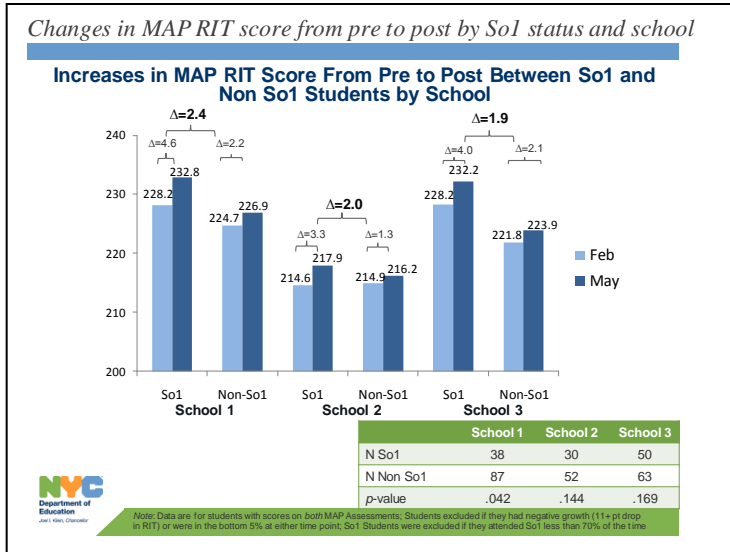
### Student Achievement Results – Afterschool

*Changes in MAP Scores From Pre to Post:* Across the three schools, students who participated in So1 increased their MAP score an average of 4.0 points (from 224.8 to 228.8). This increase was significantly larger than students who did not participate in So1 who increased their MAP score an average of 1.9 points (from 221.3 to 223.2); ( $F[1,318]=7.813, p=.006$ ).



It is important to note that So1 afterschool students received this math instruction *in addition* to the math they were receiving in their regular class during school hours. When averaged across the sample, it was noted that So1 students received approximately 80% extra minutes of math in the study time frame relative to students who did not participate in the program. However, even adjusting for this by increasing the non-So1 students' gain by an additional 80% (which assumes a direct linear relationship between score increases and minutes of math instruction) revealed that So1 students still displayed greater MAP RIT score increases (4.0 pts) compared to non-So1 students (3.5 pts).

*Changes in MAP Scores From Pre to Post by School:* Examining schools individually revealed that within each school, students in So1 made larger gains than students not in the afterschool program



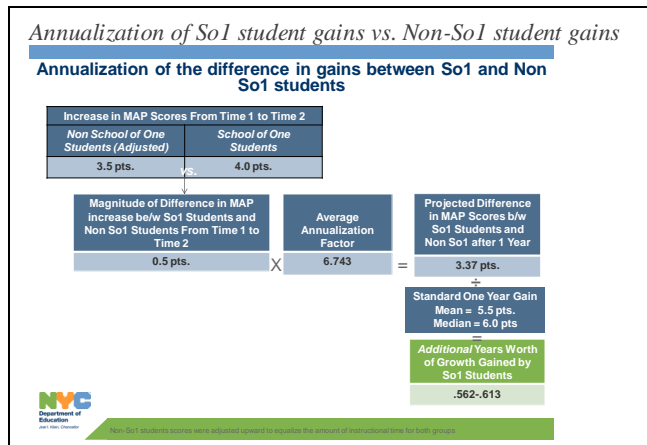
*Annualization of Achievement Gains:* Additional analyses were conducted for illustrative purposes to estimate what student gains might look like had they continued at the same level of progress over the course of an entire year. To calculate this, the total number of minutes of math per year that students received at each school was divided by the available minutes of math instruction one could have received during the course of the So1 afterschool program at that school. An average annualization factor was calculated by weighting the average annualization factors across the three schools.

### Annualization Factor Calculations

	M131	X339	K228
Available program mins	1,800	1,890	1,995
Instructional days in regular school year	180	180	180
Minutes per day (math)	61.6	72.0	76.8
Minutes per year (math)	11,088	12,960	13,824
Annualization factor	6.16	7.31	6.50

Weighted Ava: 6.743

The difference in the gain in MAP RIT score over the course the So1 instructional period between groups (4.0 points vs. 3.5 [weighted] points=0.5 point difference) was then multiplied by this annualization factor.



When annualizing this difference of 0.5 points, one can project a difference in MAP score between So1 and Non-So1 students of 3.37 points after one year. As the typical gain of a 6<sup>th</sup> grade student over one year is 5.5-6.0 points (According to reports by NWEA), this additional 3.37 point gain for So1 students represents the potential for an additional 6 months of growth for So1 students relative to their peers.

### Student Achievement Results – In-School

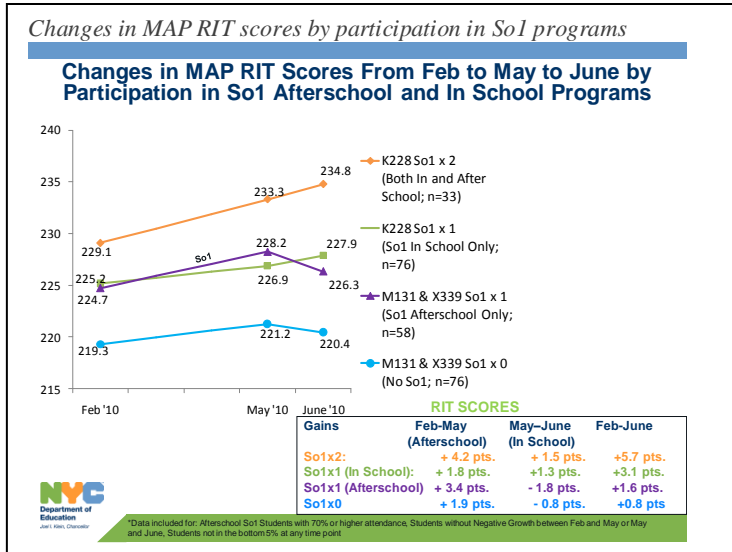
Changes in MAP scores in response to the So1 in-school program (May to June) were evaluated as a factor of previous So1 afterschool status. The table below presents the afterschool and in-school So1 status of students in each group.

Assessment of changes in MAP RIT score from February to May to June by Group revealed a significant group interaction ( $F[2,478]=3.292, p=.004$ ) with the greatest increases (+5.7 RIT points) across the entire time frame found for students who participated in both the So1 afterschool *and* the So1 in-school program and the smallest increases (+0.8 RIT points) being found for students who did not participate in So1 during either time frame.

Additionally, examination of changes in MAP RIT score from May to June between students in the So1 in-school program relative to those in the other two schools (regardless of previous So1 afterschool status) revealed a non significant trend ( $p=.092$ ) towards greater increases in MAP score from May to June among students who participated in the So1 in-school program relative to those who did not.

Number of students per group by So1 participation

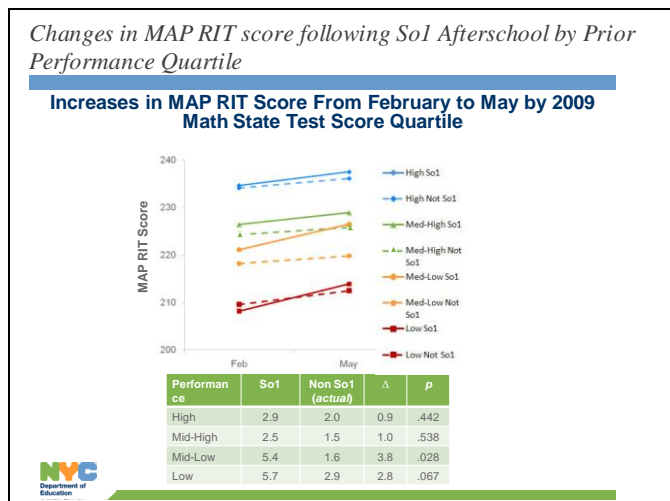
	So1 Afterschool?	So1 In-School?	N
Group 1	YES	YES	33
Group 2	NO	YES	76
Group 3	YES	NO	58
Group 4	NO	NO	76



### Student Achievement Results – By Independent Factors

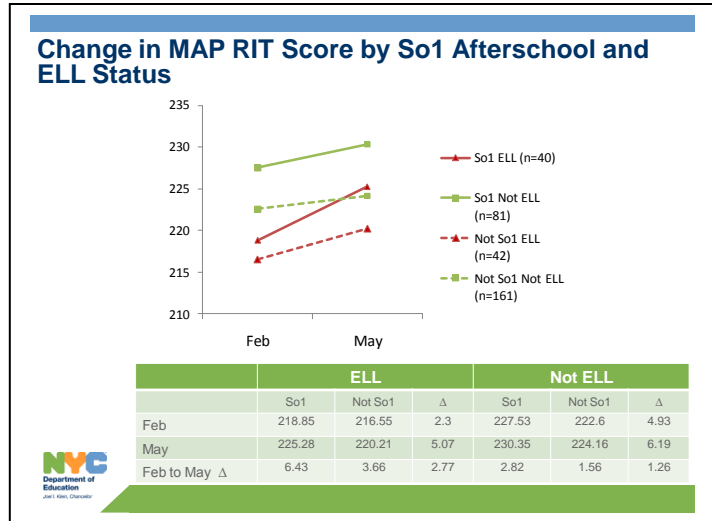
**Results by Prior Performance Quartile:** Analyses also examined whether the gains in MAP RIT score following So1 varied as a function of students’ starting performance level. This analysis sought to answer the question of whether the So1 program is more effective at increasing the performance of certain groups over others (i.e. previously high or low performing students). To answer this question, all students were split into quartiles based on their 2009 New York State Math scale score.

Analyses then assessed whether the changes in MAP score following participation in So1 differed as a factor of prior academic performance, and whether any potential differences were greater in So1 relative to non-So1 students. Analyses in both the afterschool and in-school samples revealed no statistically significant relationship between prior math performance and increases in MAP score following So1 – indicating that the program’s effectiveness is not limited only to certain subgroups of students based on prior academic performance.



Analysis of student MAP RIT scores in response to the afterschool program revealed that the difference in the increase in performance between So1 and non So1 students was (non significantly) greater in students who had previously lower academic performance. More specifically, So1 students in the highest and second highest quartiles increased an average of 2.9 and 2.5 RIT points, respectively, while those in the lowest and second lowest quartiles increased an average of 5.7 and 5.4 RIT points, respectively. However, given the small sample size as well as the non-replication in response to the in-school program, further evaluation is warranted before drawing any firm conclusions.

*Results by Prior English Language Learner Status:* Analyses also examined whether the gains in MAP RIT score following So1 afterschool varied as a function of ELL status. Results revealed that in both ELL and non-ELL groups, So1 students displayed significantly larger gains than non So1 students ( $p=.013$ ). In both So1 and non-So1 student groups, non-ELL students had larger gains from Feb to May than ELL students ( $p<.001$ ). However, the difference in the gains between So1 students and non-So1 students was not significantly greater for non-ELL students than for ELL students ( $p=.352$ ). Comparable analyses in response to So1 in-school were not possible due to small, uneven sample sizes.



### Students' and Teachers' Opinions of So1 - Methods

Following each implementation of So1 (in May for the afterschool program and in June for the in-school program) students who participated in So1 and their teachers were administered opinion surveys.

Student surveys addressed topics including:

- how So1 compares to traditional math instruction,
- how much they liked various aspects of So1 that may differ from more traditional math instruction (i.e. having a schedule that changed every day, earning points, learning from different types of teachers, taking assessments), and
- students' favorite and least favorite aspects of So1.

Teacher surveys addressed topics including:

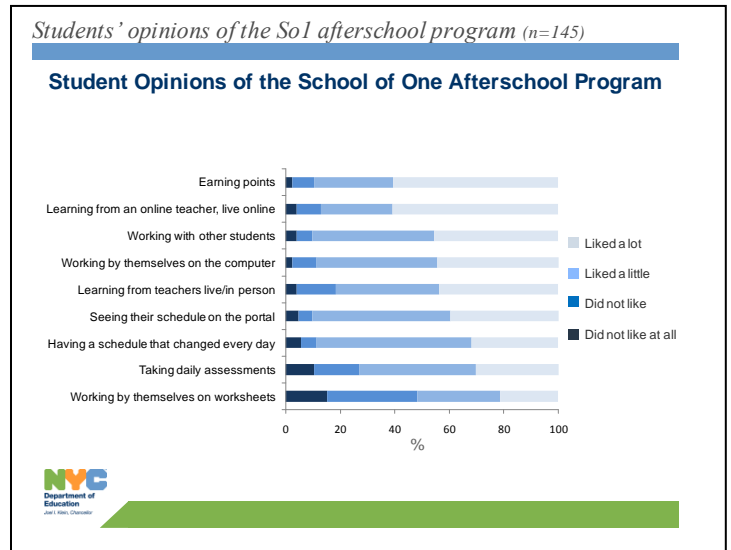
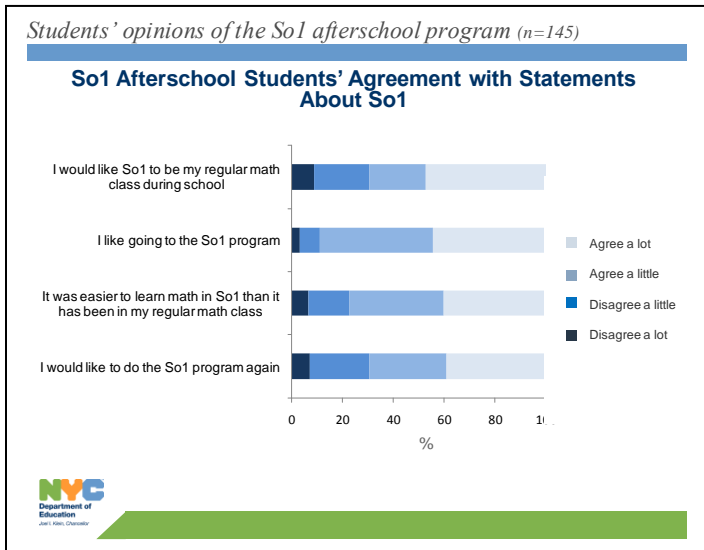
- how they felt about their teaching abilities following participation in So1,
- how they perceived So1's impact on students' learning,
- how they believed So1 compared to traditional forms of math instruction and whether So1 was better/worse at reaching special populations (i.e. students with special needs, English language learners, low performers),
- their overall opinions about the design of So1 as an effective instructional model for teaching math, and
- what they thought worked best and what they would change.

*Students as a whole enjoyed the in-school program and thought it was easier to learn math in So1 than it was in their regular classroom.*

### Students' Opinions of School of One

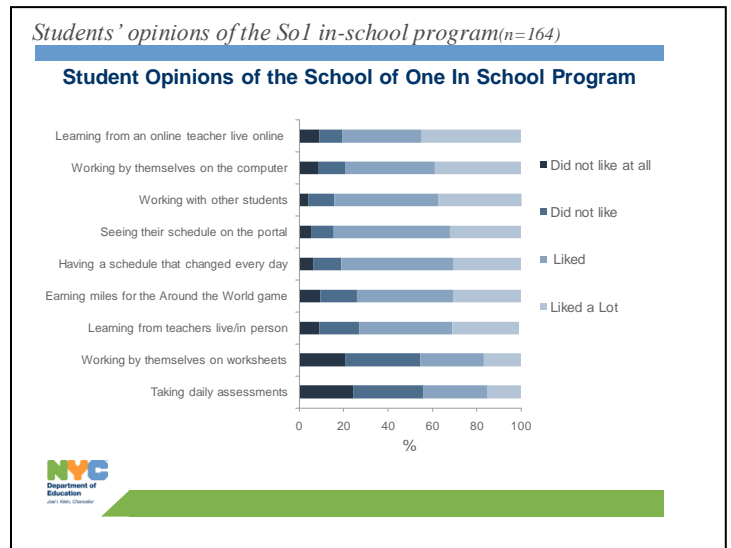
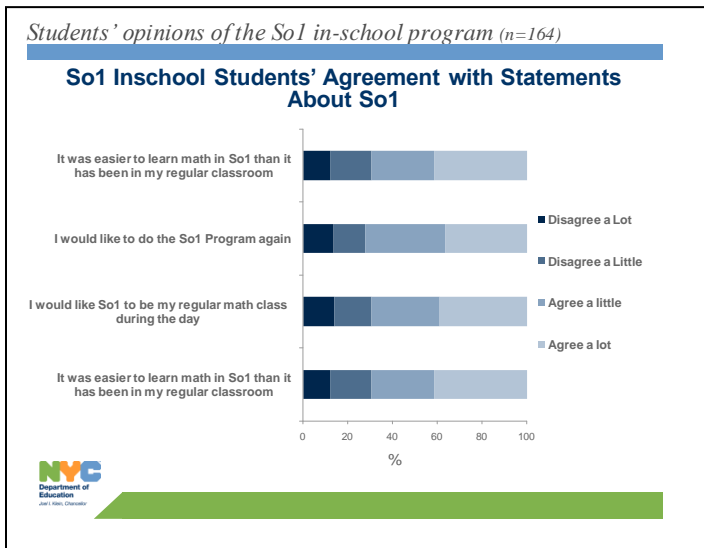
Overall, students had very favorable opinions of the So1 program:

- Students enjoyed the afterschool program and agreed that they would like it to be their regular math class during school.
- So1 afterschool students most liked earning points (as part of a motivational game that put kids on teams to create a sense of community), learning from an online teacher, and working with other students while they least liked taking daily assessments and working by themselves. Open-ended responses paralleled these findings.
- So1 afterschool students least liked taking daily assessments and working by themselves on worksheets.



Opinions of the So1 in-school program were similar to the afterschool program:

- Students as a whole enjoyed the in-school program and thought it was easier to learn math in So1 than it was in their regular classroom.
- So1 in-school students most liked working with other students, learning from an online teacher, and seeing their schedule on the portal while they least liked working alone on worksheets and taking daily assessments. Open-ended responses paralleled these findings.



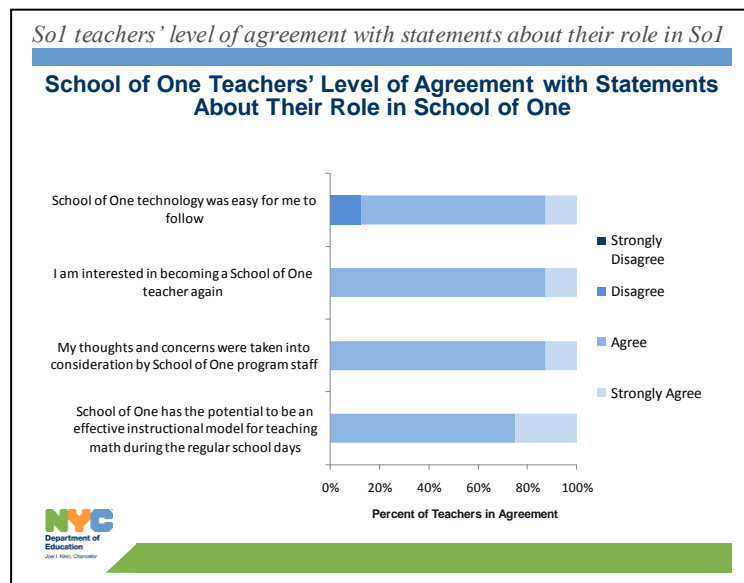
### Teachers' Opinions of School of One

Teachers rated their agreement with a number of statements about the effectiveness of So1 on student outcomes as well as their personal experience with the program. The data presented is based on reports from eight So1 afterschool teachers across the three schools who participated in the So1 afterschool program and three teachers from the one school which implemented the So1 in-school program. While (given the limited number of participating classes in this pilot) data come from a small sample of teachers, responses were quite mixed and highlight the need for a more in-depth assessment of teachers' opinions, attitudes, and responses towards the program.

#### Teachers' School of One Afterschool Opinions:

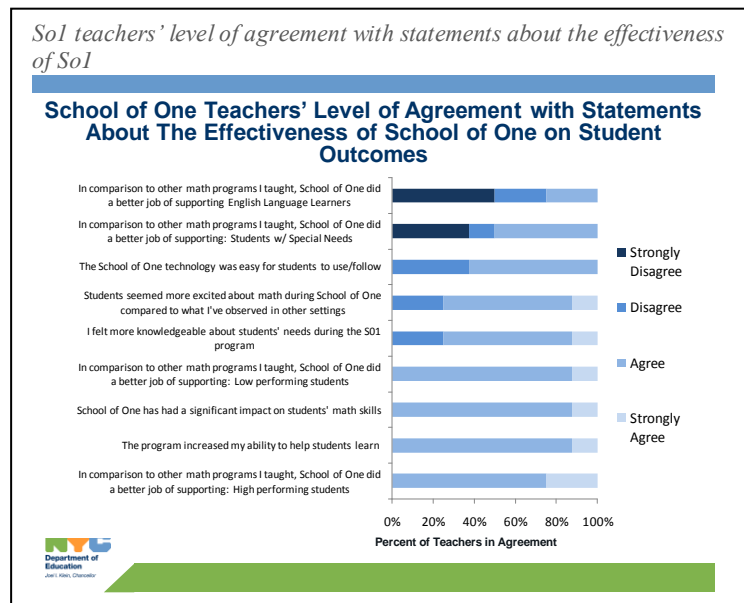
Overall, afterschool teachers thought that their thoughts and concerns were taken into consideration by the So1 program staff, that So1 program has the potential to be an effective instructional model for teaching math during the regular school days, and were interested in becoming a So1 teacher again.

Afterschool teachers were also very positive regarding the effectiveness of So1, notably the program's ability to help students learn and the program's overall impact on students' math skills. Afterschool teachers were slightly less positive regarding So1's ability to help certain sub populations of students.



All teachers agreed that School of one had a significant impact on their students' math skills and that So1 increased their ability to help students learn. All teachers also agreed that, in comparison to other math programs they had taught, So1 did a better job supporting both low and high performing students.

Teachers were less likely to agree that the program did a better job at supporting students with special needs or English language learners relative to other math programs they had taught. Responses from in-school So1 teachers paralleled these findings.



Positive responses were also displayed by So1 in-school teachers, whereby all three teachers agreed that:

- the program helped them learn new approaches to teaching math that they plan to use again,
- they felt more knowledgeable about students' needs during the program than they did before participating,
- that the program increased their ability to help students learn,
- the technology was easy for students to use/follow, and
- students seemed more excited about math during the program compared to what they've observed in other settings.

*Teachers' School of One Opinions – Open Ended:* Open ended questions, while only answered by a few teachers, gave better insight into teachers' opinions of the program. Specifically:

- Teachers highlighted the positive impact of small group instruction, daily assessments, and the variation in schedules.
- Teachers noted the desire for more/longer small group instruction and a deeper exploration of math concepts (versus skills acquisition).

## Discussion

Based on the results from the current evaluation, So1 appears to be promising educational model. The gains in math achievement among So1 afterschool participants significantly exceeded those who did not participate in the program. Those who went on to participate in So1 during in-school hours (albeit only for a short period of time) displayed a similar pattern of results. These outcomes do not appear to differentially affect students based on their prior level of performance.

In addition to the benefit of math achievement gains following So1, students and who participated in the program had very positive attitudes about the program. However, some students noted that they did not enjoy the assessments or felt that the assessments were not long enough to gain a true sense of whether they knew the material.

Similar to students, teacher shared exceptionally positive attitudes about the So1 program, and believed that the program helped them learn new approaches to teaching math that they plan to use again. While certain teacher comments highlighted the need to further examine whether the So1 program is adequately addressing the needs of certain at-risk populations (i.e. ELLs/SPED), responses came from a small number of teachers, thus highlighting the need for more in depth teacher assessment.

While results from the current evaluation show the potential for So1 to be successful in an in-school setting, it is important to note that conclusions are limited by two main issues: the study was not a randomized-control design, and took place over a short period of time. Annualizations of gains require a number of assumptions which can only truly be tested using a long-term implementation of the program. Given these issues, we propose a number of recommendations for future implementation and evaluation of the School of One program

### *Recommendations for Future Evaluation*

Based on RPSG's findings from the 2010 Afterschool and Short-Term In-School evaluation, we recommend the following for future evaluation of the program:

- *Long-Term Evaluation.* While the gains seen in the current evaluation were small, they were quite substantial when projected outward using annualization figures. However, these annualizations require a

number of assumptions to be made (most notably the linearity of gains over the year). The best way to obtain an accurate picture of the long term gains in student achievement is to implement the program over the course of an entire year.

- *Randomized Design.* All So1 evaluations that have taken place to this date have been quasi-experimental. A randomized control design would allow for a more rigorous evaluation of the impact of the program and the assurance that any difference in outcomes observed between the treatment and control schools is actually due to the causal effects of the program.
- *Qualitative Teacher Evaluation.* The data reported with respect to teacher attitudes came from a small population of teachers (eight afterschool, three in-school teachers) as the program was only implemented in three schools. However, the data that was collected provided a wealth of information indicating that teachers are a valuable source of information for the purposes of improving the program. Future evaluation should attempt to gather even richer information from this data source, perhaps through the use of in-depth interviews and/or focus groups. More specifically, data should assess whether the program is effective at targeting the needs of higher risk students (i.e. ELLs, SPED).

After promising results with the 2010 Afterschool and In-School programs, So1 will begin the next phase of the pilot this Fall (School Year 2010-11). In this next phase, the same three NYC schools assessed in the current evaluation will be implementing So1 in their regular math classroom for the entire school year. At Schools 1 and 3, So1 will be implemented across grades 6, 7, & 8 during regular school hours. At School 2, So1 will be implemented throughout all 6<sup>th</sup> grade classrooms and two or three 7<sup>th</sup> grade sections, with more 7<sup>th</sup> grade sections phasing in over the course of the school year.

#### References

Center for Children and Technology/Education Develop Center, Inc. Prepared by: Light, D., Reitzes, T., & Cerron, M. (October, 2009). *Evaluation of the School of One Summer Pilot: An Experiment in Individualized Instruction*

New York City Department of Education's Research and Policy Support Group (March, 2010) *School of One Evaluation – 2009 Summer Pilot Program*