

Executive Summary

SEEK Evaluation 2008



Data collected from the three SEEK programs held in the summer of 2008 are presented in this report. One program was held in Columbus, Ohio. It, along with a second camp in Washington, DC served to pilot the SEEK middle school program targeting students who had just completed 6th, 7th or 8th grades. The third program was also in Washington, DC. It was the second year of the elementary program serving students who had just completed 3rd, 4th or 5th grades. In Columbus gender of participants was fairly balanced, however, in DC boys significantly outnumbered the girls at each grade level.

NSBE members throughout the country and Canada served as mentors for each of the programs allowing for a ratio of one adult to five or six students. In Washington, DC the SEEK program was full day offering classes and after school care at both the middle and elementary school locations. Parents dropped off and picked up their children from the schools. In Columbus, students were bussed to and from the SEEK program site. It was not an all day program as students were picked up at 2:30. Mentors lived on the campuses of Howard University in DC and The Ohio State University in Columbus.

In 2007 subjective mentor, student and parent feedback indicated the SEEK pilot program met its goal of exposing youth to science, technology, engineering and mathematics (STEM) fields by providing hands-on activities to engage students in engineering design. This year, however, more objective metrics were designed to gather data. A brief pre and post assessment was developed for each grade. Each assessment included open ended questions about the students' interest in math and science, exposure to engineering; problems based on grade level math standards and problems based on the SEEK program/intervention curriculum. As in the previous year, input from mentors, teachers and parents was solicited through evaluation forms, reflections, and interviews.

Results from the student generated data from the pre and post-tests indicate that the majority of our participants, across the board, like math and science. They liked these subjects mainly because they felt they were good in them or they perceived the subjects to be fun. Those that did not like these courses thought they were hard, did not do well in them, or thought they were boring. Many students reported they knew an engineer prior to their SEEK participation. Some shared they knew what engineers do and gave a wide variety of responses ranging from knowledge of a specific field of engineering to very general responses. The number of students who reported they knew what engineers do increased and became more specific as a result of their SEEK experiences.

Students in all grades were behind in the mastery of key grade level math standards with approximately a third of the students not being able to solve grade level problems. On some problems a majority of students were not able to answer either problem targeting a specific standard correctly. Younger students performed better on their math standards problems than did the older students. Pre and post data comparisons on the questions and problems based on the materials covered in the SEEK curriculum, show that overall, students performed better on the post test. This was measured by an increase in the average mean difference between pre and post test scores on the program/intervention sections of the assessment. Tables for each grade at each site are included with these data.

Mentors received four days of training prior to each SEEK camp. The vast majority of them rated their training favorably. Columbus mentors rated it more favorably than Washington, DC mentors. Mentors, like their students, prefer hands-on training. They also prefer training directly related to classroom and students needs. Mentors reported problems with logistics and organization at each site. Regarding their students, mentors indicated the majority of their students were actively task engaged and gained a lot by participating in SEEK. They reported developing positive relationships with their students and looked forward to returning to a SEEK program in the future. However, some mentors did report challenges with students who did not want to be in the program and students who had various behavior problems. They shared descriptions of the various types of students and problems encountered in their reflections, some of which are included in this report.

At the Columbus site, nine teachers were hired to participate in the program through the Columbus School District as NSBE was part of a collaborative effort which included the Columbus School District. Six of them participated in the same training as the NSBE mentors and were expected to serve as mentors, just as the few credentialed teachers who were NSBE members served as mentors in the program. However, this did not occur and the Columbus teachers served as general support for the program. Although they perceived the program as being very successful, the teachers felt that mentors needed more training and had problems working with some of the mentors. Lack of role clarification and communication created different expectations for the Columbus teachers by mentors and by the teachers themselves.

Seven parents who came to the end of program competitions in Columbus were interviewed by phone after the program was over. All of the seven reported the program was very positive for their students and they encouraged NSBE to continue the program. However one parent shared her daughter would be going to a violin camp next summer and shared although her daughter was actively engaged in the SEEK program, she was a little disappointed about how the competitions were organized. Parents talked about how they appreciated NSBE and wanted their children to continue their involvement with NSBE through NSBE, Jr. chapters in Columbus.

Mentors, parents and teachers indicate that students gained confidence, skill and valuable experiences through their participation in the SEEK program. One mentor captures this general consensus when she wrote: "The kids gained new knowledge about engineering and how to solve problems. They got a new perspective of life and that gives them more options for when they grow up." There was also consensus that the program met its goals.

The report ends with recommendations for improvement including restructuring of the training, additional staff, better ways to collect program metrics, and suggestions for better program organization.

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SEEK 2008 Evaluation Report

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Introduction/Background

This is the second year of the Summer Engineering Experience for Kids (SEEK) Program launched by the National Society of Black Engineers. As a result of the recommendations of the Long Range Planning Taskforce, NSBE initiated the pilot SEEK Program in the summer of 2007 in Washington DC. It was designed to:

- Expose youth to science, technology, engineering and mathematics (STEM) fields at an early age;
- Provide daily hands-on activities to engage students in engineering design; and
- Fulfill the mission to increase the number of culturally-responsible Black engineers who excel academically, succeed professionally and positively impact the community.

The pilot SEEK program was implemented at Friendship Charter Public School in Washington, D.C. from July 9th through 27th, 2007. It was a collaborative effort between the school, NSBE and Society of Automotive Engineers (SAE) International. SAE provided the hands-on curriculum used in the program and the accompanying training. The pilot program included approximately two hundred and fifty third through fifth graders and seventy NSBE mentors from across the country. Admission to the pilot program was free. Parents were responsible for bringing their children to the program between 7:30 am-8:00 am and picking them up between the hours of 4:00pm-5:00 pm. Classes convened from 8:30am-3:00 pm each day. In addition, breakfast, lunch and snacks were provided daily.

Data collected in the pilot program indicated that both students and mentors gained from their experiences with the program. The goal of exposing the target students to STEM areas, and to engineering particularly, was met by all accounts. Mentors unanimously agreed that the SEEK program did help fulfill NSBE's mission by introducing students to engineering who would potentially be part of the STEM pipeline. Mentors and parents of the participants felt the program did positively impacting their community.

As a result of the success of the pilot program, NSBE sought to expand SEEK. Battelle facilitated NSBE's involvement with the Ohio STEM Learning Network in partnership with the Columbus School District. The Network is a privately-supported, non-profit initiative designed to advance high-quality STEM education for all students in Ohio. It is managed by Battelle and a team of affiliated entities. Planning occurred through out the school year to design a pilot SEEK middle school program. This planning resulted in two additional SEEK programs in the summer of 2008, a middle school pilot program in both Washington, D.C. and in Columbus, Ohio. The elementary school program in Washington, D.C. continued for the second year.

Program Description/Logistics

In Washington, D.C. Friendship Charter Public School continued to partner with NSBE providing space. Their Woodridge Campus housed the middle school program intended for students who had just completed the sixth, seventh or eighth grades. The

elementary SEEK program for students who had just completed the third, fourth or fifth grade was housed at Southeast Academy. Students participating at the Washington, D.C. sites had to get to and from the schools in the morning and afternoon. SEEK provided extended day programs for each of the two sites. Thus students could be at a site from 8:30 AM until 5:00 pm. The middle school program in Columbus was housed at Arts Impact Middle School. Students were bused from throughout the district to the site in the morning and bused back at 2:30 each day. The SEEK camp had the entire facility in Columbus but shared the facilities in Washington, D.C. with other summer programs.

The elementary program repeated the schedule and curriculum of Year 01. There were three different SAE 'toys' to design: Jet Toy, Steel Can Rover and Skimmer. Each student spent one week with each of the three curriculums. Thus, they would rotate at the end of each week. There were weekly competitions where the community and parents could witness the work accomplished by their children. As in Year 01, over three hundred elementary students registered for the SEEK elementary program. The mentor to student ratio was approximately one to six. The final count of students who participated in the elementary program was 241. Forty-one mentors participated.

The middle school program had a different schedule. There were two SAE 'toy' curriculums, a gear toy and a flight toy. All participating students worked with one of the curriculums in the morning and the other in the afternoon. The competition for the products of their work was scheduled for the last Friday of the program. Thus middle school students had the same mentors throughout the three week program. Two hundred and thirty nine students registered for the Washington, D.C. program. Three hundred and sixteen registered for the Columbus program. However, all did not attend the program. Attendance figures indicate that there were between 200 and 250 students at each camp. The mentor to student ratio was approximately one to six/seven. The final count of mentors in the middle school programs was: Washington, D.C. 41; Columbus, Ohio 38. Columbus public schools also hired ten teachers to participate in the program.

Data Sources

Carroll Consulting was contracted to evaluate the impact and success of the SEEK programs. Evaluation metrics were designed to capture the experience of the participants, both mentors and students. Data in this report come from the following sources:

- Pre/Post-tests of students – A brief test was developed for each grade. Each test included three components: 1) open ended questions about students' interest in math and science and knowledge of what engineers do to begin a profile of student participants; 2) questions based on math standards which students should have learned in their previous school year to assess participants' academic standing; and, 3) questions based on the SEEK program curriculum (multiple choice and vocabulary matching questions based on the SEEK program curriculum) to serve as an indicator of the academic impact of the program;
- Training assessment form – Mentors were asked to rate their training experience by completing an evaluation form.

- Mentor reflections – Mentors were to journal the progress of the students who were assigned to them.
- Informal interviews with mentors and program staff – The principal at the Columbus school, the Lead Teacher of the elementary site and NSBE site directors at both middle school sites provided important information and insight about the programs.
- End of program assessment forms – Mentors were asked to complete and email an overall program evaluation at the end of the program.

In addition to these data, Columbus teachers were asked to email their reflections on their summer experience. At the Columbus competition held on the last day of the program, approximately 14 parents came to observe. All were asked for permission to do follow up phone interviews with them about their child's experiences in the program. All agreed and seven of these parents were available when called and did participate in brief post program interviews.

The data are presented in two sections. First the student generated data are reported. It is presented by site. The second section focuses on the mentors, staff and parents. This includes their training, informal interviews, student reflections and end of program evaluations. Test and survey data were analyzed using the statistical package for social science software. Phone interviews were taped and transcribed and field notes were taken at informal interviews and observations. This report concludes with a short summary and recommendations for improvement.

Section I – Student Generated Data

The short tests given to students at the onset and end of the program serve as the primary source of data for this section. The first half of the test included the cover page which asked students whether they liked math and science, and, about their knowledge of engineers. It also included six to eight questions on targeted math standards for the specific grade that the student had just completed. Two questions were used for each standard; one each given at pre and post testing. This half of the test was intended to solicit data to develop a profile of participating students. The second half of the test was to assess the actual program intervention. It included questions that targeted standards and vocabulary which were to be taught in the three weeks of SEEK. The second half of the test was identical in pre and post administrations for the middle schools (both the questions and the vocabulary). The vocabulary was identical in the elementary pre and post administration. However, some of the questions varied by grade. Thus, the second half of the test serves to evaluate whether or not the students gained new knowledge based on their involvement with SEEK.

The tests were given to all students in attendance on the day of the assessments. Some students were absent on testing days. In addition, some students were given the wrong pre or post-test by the mentors. For example a student completing the 6th grade may have been given a test for a student completing the 7th grade. In the middle school data, standards based questions in the tests given to the wrong students were not included in the target math standards profile. However, the pre and post program data were the same across all students in the middle school and were included in the program evaluation data. This is also true in the elementary sample. Wrong level test questions were not included in the profile but identical pre and post-test questions were

included in the assessment. This reduced the size of the sample, particularly in the data for 'matched' intervention/program assessment comparisons. However, the numbers were sufficiently large at each site to develop credible and useful analyses.

Sample students gave a wide variety of reasons why they did or didn't like math or science. These did not vary much across the three sites. Regarding math, the three most common reasons given for liking math were that it was a positive challenge (kids liked it); math was seen as something that was useful for the future; and, math was fun. Samples of students' responses as to why they like math include:

- I like math because it comes easy to me.
- I like math because it challenges my mind.
- I kinda like math because some math teachers are fun.
- Because the skills taught in math are the ones I need to obtain to be successful when I major in civil engineering.
- I like math because numbers are fun to count.
- I like math because you use math in your everyday life and math can help you in most sports.
- It comes to me very easy and I can count quickly in my head.
- It is the first thing I learned in preschool.
- I think it's easy and it's fun.
- Because when you grow up you might want to be an accountant.
- It is challenging and I like to work with numbers.
- I like math because it's the one thing that helps you in life. Math is very tricky sometimes but interesting.
- Because it is challenging and it deals with everything we do in life.
- I enjoy working out problems.
- Because you do it everyday and it has to do with money!!!
- After I understand what to do math becomes fairly fun. Math can sometimes be a challenge, but it's worth all of the effort.
- I like math because without math there would be nothing, no science, no physics, and no chemistry.
- Math is challenging but once you get it, it's kind of fun.
- I like math because my math teacher made math fun and interesting.
- I like math because I like using numbers and finding different ways to do things.
- Because it is challenging and it deals with everything we do in life,

On the other hand, students who did not like math felt it was too hard and boring. Some felt they were just not good at it and others just lost interest because it was not seen as fun.

- It is boring but you need it.
- I don't like math because it is hard and confusing because sometimes I loose count; that confuses me.
- Because it's too hard.
- My mom usually doesn't know what to do and I have to do it all by myself.
- I don't like math because I am not good at it and it is boring and complicated.
- Because it gets really difficult and I have struggles with it.
- I am not good with numbers.
- I don't like math because it doesn't interest me. I don't have fun with it.
- I don't like math because it is hard for me to comprehend.
- I think it is boring.

Students reported a wider variety of reasons for liking science. Many were knowledgeable of the many different types of science. Most liked to do the experiments, especially with chemical. The 'hands-on' approach was also appreciated by students who thought science was fun and interesting. You could tell that curiosity and wonder about the world drove many to like science. The following sample comments show the breadth of their responses.

- I like messing with different chemicals knowing that they can blow or fizz up.
- Science is interesting.
- I like science because you can learn about different landscapes.
- Because it is fun and I like doing hands-on activities.
- I love learning about biology, astronomy and all kinds of chemicals because I find it interesting.
- I like science because there is a lot of chemical and lab and it more fun.
- I love learning about biology, astronomy and all kinds of chemicals because I find it interesting.
- Science allows you to test things using laws and theories.
- I like science because there's so much to discover and explore. I like the experimenting aspect too.
- I love to do experiments. I also like to mix different chemicals and see what the reaction will be.
- It's amusing to learn about how science has so much to do with life.
- I like science because I like to learn about the world.
- Science is fun plus I like being hands-on.
- I like to learn about nature.
- I like some science like space science and under the sea stuff.
- Because I like animals and knowing how the body works.
- I enjoy science because science is amazing, you get to do experiments and make things that you would have never thought of.
- Yes I like science because I like to explore things that I haven't tried.
- I like it 'cause it keeps me interested.
- It teaches me about the world and allows me to wonder "what if?"

Just as in math, students who felt that science is boring or too hard did not like it. Some did not like the work involved such as doing experiments or understanding numbers. The following are typical responses of students who responded they did not like math:

- Because I don't, it's boring.
- Because it is hard to me.
- It dull and boring.
- I sometimes like science because it's interesting, but I dislike the areas of science that I can't comprehend.
- I don't like science in general but I like forensic science because you use forensic science to solve crimes.
- I don't like to experiment.
- Because there are too many big words I can't remember.
- It's too complicated.
- It is too boring!
- No because to deal with science you have to use numbers.
- I don't know why I don't like science it just doesn't keep me interested.

- Because it is too hard and kind of boring.

Many students shared that they also knew what engineers do across the three sites. Some answers were very sophisticated while others described areas of engineering activities or a very general knowledge of engineering as seen by the following responses:

- Work with electronics, cars and other things.
- Engineers improve machines and/or simple machines such as cars, jets, even electricity. Engineers also design trains.
- Engineers are people who go to college and study things then they do what they study.
- They build things that help mankind/
- Engineers can be anything from robotics to cars or even scientist/
- Engineers build stuff like cars and the mechanics that make the materials that you need to make cars or even a spaceship.
- Engineers build things and work on things that are broken.
- There are different kinds of engineers like civil, mechanic, and electric engineers.
- Engineers do all types of things to help causes and change the way the world is.
- Certain types of engineers build or fix cars or phones.
- Engineers do everything that deal with design, structure, and chemicals. They basically create things for everyday.
- Engineers help us make everything work.
- Design stuff such as websites and make computers, cars, etc.
- An engineer is someone that fixes or builds mechanical objects.
- Engineers built things and help the community.

Columbus Middle School Findings – Student Profile

Viable data were collected on 199 students in the Columbus SEEK program: 70 sixth graders; 78 seventh graders; and, 51 eighth graders. The group was fairly evenly split between males and females as shown in Table 1. There were fewer 8th graders than sixth and seventh graders.

Table 1 – Columbus Students by Grade and Gender¹

	6 th grade	7 th Grade	8 th Grade	Total
Male	33	38	26	97
Female	37	40	25	102
Total	70	78	51	199

The majority of participants across the board indicated that they liked math and science. Table 2 presents the data for Columbus students on the questions of liking math and science by gender.

¹ These numbers do not represent all of the students who participated in the Columbus program. It includes all of the student on which we have viable assessment data. They took the appropriate pre and/or post-test.

Table 2 – Columbus Students Who Like Math and Science by Grade and Gender²

	% Likes Math			% Likes Science		
	6 th grade	7 th grade	8 th grade	6 th grade	7 th grade	8 th grade
Male	64.5	63.2	88.8	80.6	76.3	92.3
Female	88.2	66.7	58.3	58.8	82.1	75.0

Columbus students did have some knowledge of engineers as over a third of them indicated that they knew engineers prior to participating in SEEK. A high percentage also indicated they knew what engineers do when they first came to the SEEK camp. These numbers increased as a result of their SEEK participation, particularly for the 7th grade boys (see Table 3).

Table 3 – Columbus Student Exposure to Engineers by Grade and Gender

% Indicating they knew an engineer prior to SEEK				% indicating they know what engineers do			
				Pre SEEK		Post SEEK	
	Male	Female		Male	Female	Male	Female
Grade 6	22.0	42.9		61.3	63.9	61.3	70.0
Grade 7	43.2	45.0		70.6	77.5	93.5	77.5
Grade 8	38.5	52.0		76.0	80.0	77.3	81.0

A series of grade level standards-based questions in math were asked in both the pre and post assessment. The purpose was to develop an academic profile of the students attending the SEEK program. There are many math standards for each grade level. A team of teachers developed a set of problems representing priority standards. These problems were used to generate the data in Tables 4, 6, and 8. Eight standards were identified per grade. Two questions for each standard were asked; one on the pre-test (Time 1) and on the post-test (Time 1). The use of two questions per standard provides a more accurate indicator of whether the student did truly master the standard or if they provided a good 'guess'. The questions, with one exception, were multiple choice questions.

SEEK students who completed the 6th grade were given the problems which focused on 6th grade standards. This procedure was followed for each grade. Students performing at grade level should be able to answer correctly all of the problems.³ Thus, the idea percent correct on these problems is 100%. Table 4 shows a wide variance in standard mastery.⁴ On some standards, nearly ninety percent of the students answered questions correctly (see Table 4, question #7). On the other hand, only twenty percent answered the second question for standard #8 correctly.

Most of sixth graders were at grade level on five of the eight target standards. The vast majority could add simple fractions. They also knew the vocabulary for mathematical comparisons. However, the use and understanding of mathematical

² Data in Tables 2 and 3 are the valid percents. In some cases students did not answer the question and are not included in these tables.

³ Students who were given the wrong grade level test were not included in the profile standards analyses.

⁴ Due to typographical errors on the actual test form a few questions were dropped for these analyses. The data reported in Tables 4, 6 and 8 represent eight standards for the 6th graders, seven for the 7th graders and six for the 8th graders.

symbols for comparative purposes, and writing/solving one-step linear equations were the two items that were most difficult for the sixth graders with over half of them not able to answer either of the two problems for these problems correctly. This pattern was true for both male and female participants. Although the sixth grade profile included students who generally like math and science, their academic profile can be described as below grade level as over a third of the sixth graders were unable to answer problems correctly on standards they should have already mastered. Sixth grade boys liked science more than girls but girls liked math more than boys. Comparable profiles are presented for 7th and 8th graders in the following section.

Table 4
GRADE 6 - Columbus Test Scores (Overall N = 70)

	Question/Problem Multiple choice with four options		Target Math Standard	% Correct	% Correct
#	Time 1	Time 2		Time 1	Time 2
Targeted Math Standards					
1	25% is ____ .25	$\frac{1}{100}$ ____ .01	The student will identify representations of a given percent and describe orally and in writing the equivalence relationship between fractions, decimals, and percents.	81.5	61.1
2	$\frac{1}{100}$ ____ $\frac{1}{10}$	$\frac{1}{1000}$ ____ $\frac{1000}{1}$	The student will compare and order whole numbers, fractions, and decimals, using concrete materials, drawings or pictures, and mathematical symbols (note: symbols were answer options for these questions)	47.7	44.4
3	On a time line the difference between -3 and 3 is ____.	The difference between 0 and 3 is ____.	The student will identify and represent integers on a number line.	55.4	63.0
4	$1\frac{2}{5} + 6\frac{4}{9} =$ ____.	$7\frac{16}{32} + 9\frac{2}{64} =$ ____.	The student will solve problems that involve addition, subtraction, and/or multiplication with fractions and mixed numbers, with and without regrouping, that include like and unlike denominators of 12 or less and express their answers in simplest form.	80.0	72.2
5	1 meter = ____ cm	10 meter = ____ cm	The student will compare and convert units of measures for length, weight/mass, and volume within the U.S. Customary system and within the metric system and estimate conversions between units in each system.	60.0	46.3
6	Which of the following is <u>not</u> a property of a square?	Which of the following is <u>not</u> a property of a rectangle?	The students will identify, classify and describe the characteristics of plane figures including similarities and differences.	86.2	66.7
7	Circle the pie chart showing that Harrison ate $\frac{1}{4}$ of the pizza?	Which pie chart shows that Harrison ate $\frac{1}{1}$ of the pizza?	The student, given a problem situation, will collect, analyze, display and interpret data in a variety of graphical methods, including line, bar, and circle graphs and stem-and-leaf and box-and-whisker plots. Circle graphs will be limited to halves, fourths, and eighths.	89.2	70.4
8	Which procedure could be used to find the value for x that will make the number sequence true? $8x = 40$?	Which procedure could be used to find the value for x that will make the number sequence true? $8x = 64$?	The student will solve one-step linear equations in one variable, involving whole number coefficients and positive rational solutions.	46.2	20.4

Columbus Middle School Findings – Program/Intervention (7th and 8th grade profile)

The majority of the middle school pre and post assessment were questions focusing on the program intervention. For each of the three grades, the same six standards based

questions were asked. These questions were aligned with the work incorporated in the SAE curriculum. Five were recommended by SAE staff and one (the question which asked for the definition of ratio) was incorporated because it was also a concept utilized in the Games to Grades⁵ training. In addition to these six problems, two sets of vocabulary matching questions were included, one set each based on the vocabulary used in the gear toy and the flying toy curriculums. Thus, we would expect that students would do better in the post-test on these program/intervention items. This was generally the case for 6th graders as shown in Table 5.

Table 5
GRADE 6 – Comparison of Columbus Matched Pre and Post-test Scores
Program Intervention Math and Vocabulary (N = 63)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.06
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	72.1	83.6	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	80.3	78.7	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	41.0	52.5	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	47.5	55.7	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	59.0	57.4	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	27.9	36.1	
Vocabulary Matching 7 – 11 = Gear Toy / 12 – 16 = Flight Toy					
7	Sprocket		36.1	68.9	Overall Gear Toy Mean Difference +.19
8	Gear Ratio		41.0	70.5	
9	Force		80.3	85.2	
10	Prototype		75.4	88.5	
11	Torque		52.5	67.2	
12	Aspect Ratio		31.1	29.5	Overall Flight Toy Mean Difference +.11
13	Projectile		26.2	32.8	
14	Drag		26.2	47.5	
15	Pitch		21.3	34.4	
16	Mode		21.3	36.1	

Sixths graders performed better on the post-test on fourteen of the sixteen items in the program/intervention section of the assessment. The three items where students did not

⁵ Games to Grades trainings, where mentors learned how to incorporate play activities into the curriculum, were piloted in all three sites this year. Mentors loved the training as it was energetic and fun for most participants. The athletic component was used. However, mentors and administrators shared bringing the grades or academic component into the follow up of the athletic activities was not consistently done.

improve their scores were in understanding the correct gear motion (#2 and #5) and the definition of aspect ratio (#12). Their greatest gain between pre and post-testing was in the understanding of the vocabulary in the gear toy.

The seventh grade student profile is similar to that of the sixth grade; they are behind in their mastery of the math standards. They are also evenly distributed between males and females. Although the majority reports they like math and science, the seventh grades girls liked math and science more than the boys. Unfortunately, they are also behind in their mastery of math standards as shown in Table 6.

Table 6
GRADE 7 – Columbus Test Scores (Overall N = 78)
Targeted Math Standards⁶

	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
#	Time 1	Time 2		Time 1	Time 2
1	$\frac{64}{1} \div 8^2$	$\frac{1}{64} \div 8^2$	The student will compare, order, and determine equivalent relationships between fractions, decimals, and percents, including scientific notation.	71.8	60.6
2	$(81 \div 3^2 \bullet 6) - 32 + 7$	$[81 \div 3^2 (6 - 32)] + 7$	The student will simplify expressions by using order of operations, mental mathematics, and appropriate tools. Exponents will be included.	60.3	33.3
3	Nicole bought a dress at Macy's for \$24.00. If the sales tax is 5% and the local tax is 1%, what is the total tax paid for the dress?	Nicole bought a dress at Macy's for \$24.00. If the sales tax is 5% and the local tax is 1%, what is the total she paid for the dress?	The student will solve consumer application problems involving tips, discounts, sales tax, and simple interest, using whole numbers, fractions, decimals, and percents.	30.8	75.8
4	Keenan has a rectangular deck that is 17 feet long by 6.5 feet wide. If he wants to make the sides of rectangular deck 50% bigger, what are the new dimensions?	Keenan has a rectangular deck that is 17 feet long by 6.5 feet wide. If he wants to make the sides of the rectangular deck 100% bigger, what are the new dimensions?	The student will use proportions to solve practical problems, including scale drawings that contain whole numbers, fractions, decimals, and percents.	50.0	66.7
5	Takeisha has a marble bag with 3 blue marbles, 6 red marbles and 9 green marbles. What is the probability that she will pull out a <i>blue</i> marble?	Takeisha has marble bag with 3 blue marbles, 6 red marbles and 9 green marbles. What is the probability that she will pull out a <i>green</i> marble?	The student will determine the probability of a given simple event and express t hat probability as a ratio, decimal, or a percent as appropriate for the given situation.	37.2	38.4
6	What is the <i>mode</i> for this data set {2, 2, 5, 6, 8, 9, 22}?	What is the <i>median</i> for this data set {2, 2, 5, 6, 8, 9, 22}?	The student will create and solve problems involving the mean, median, mode, and range of a set of data.	83.3	84.8
7	Write the following as an algebraic expression: Jerome is 16.2 % taller than Amos.	Write the following as an algebraic expression: Jerome is 1.62 % taller than Amos.	The student will write verbal expressions/sentences as algebraic expressions/equations.	6.4	15.2

As Table 6 shows, the 7th graders particularly struggle with probability (#5) and writing algebraic expressions (#7).

The 7th graders improved on all but two of the sixteen program/intervention items. The items that students did not improve were question #2 where students were asked about gear ratios (see Table 7) and the vocabulary matching for 'mode'.

Table 7
GRADE 7 – Comparison of Columbus Matched Pre and Post-test Scores
Program Intervention Math and Vocabulary (N = 63)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.09
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	69.8	85.7	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	79.4	74.6	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	50.8	65.1	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	47.6	63.5	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	63.5	65.1	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	30.2	42.9	
Vocabulary Matching 5 – 11 = Gear Toy / 6 – 14 = Flight Toy					
1	Sprocket		52.4	68.3	Overall Gear Toy Mean Difference +.12
2	Gear Ratio		52.4	74.6	
3	Force		81.0	81.0	
4	Prototype		85.7	82.5	
5	Torque		46.0	73.0	
6	Aspect Ratio		28.6	34.9	Overall Flight toy Mean Difference +.07
7	Projectile		25.4	42.9	
8	Drag		38.1	44.4	
9	Pitch		19.0	36.5	
	Mode		52.4	39.7	

⁶ One of the standards questions is not included in this analysis due to errors on the test question (The student will find common multiples and factors, including least common multiple and greatest common factor.)

Students had the greatest improvement on the matching of the gear toy vocabulary which is consistent with the results from the 6th graders. But unlike the 6th graders, the second highest pre post difference was in the standards questions followed by the flight toy matching questions. This was reversed for the 6th graders.

There are fewer 8th graders in our sample. The profile shows that they are evenly divided by gender. The reverse trend is found when compared to the 7th graders: the boys like math and science more than the girls. Students did worse overall on the profile standards questions. Percentage correct did not exceed seventy-five in any of the areas tested with the majority of the percentages indicating that nearly half of the students did not fully master the targeted standard (See Table 8).

Table 8
GRADE 8 – Columbus Test Scores (Overall N = 51)
Targeted Math Standards⁷

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	Triangle A is 33% smaller than triangle B. What is the perimeter of Triangle A if the perimeter of triangle B is 59 cm?	Triangle A is 33% larger than triangle B. What is the perimeter of Triangle A if the perimeter of triangle B is 59 cm?	The student will use proportions to solve scale-model problems with fractions and decimals.	54.9	50.0
2	$10^3 - 10^2 =$	$10^3 + 10^2 =$	The student will simplify numerical expressions involving exponents, using order of operations.	51.0	54.5
3	Jose has been driving 64 miles per hour for 8 hours. If <i>distance = rate X time</i> , how far has she traveled?	Jelan has been driving 64 miles per hour for 10 hours. If <i>distance = rate • time</i> , how far has she traveled?	The student will solve practical problems involving whole numbers, integers, and rational numbers, including percents. Problems will be of varying complexities, involving real-life data.	72.5	75
4	Which is <i>not</i> a property of a pyramid?	Which is <i>not</i> a property of a cube?	The student will describe, classify, and construct plane figures and solid figures, including prisms, pyramids, cylinders, and cones.	54.9	75
5	What is the solution to $\frac{x}{6} + 12 = 18$?	What is the solution to $\frac{x}{6} + 20 = 26$?	The student will solve multi-step equations in one variable.	54.9	43.2
6	Create a pie chart showing the % of money that each sibling receives: Alisha 20%, Amber 30%, Ben 15 %, and Jose 35 %.	Create a pie chart showing the % of money that each sibling receives: Alisha 10%, Amber 30%, Benjamin 15%, and Deron 45 %.	The student will describe and represent relations using tables, graphs, and rules.	70.0	70.5

⁷ Two of the standards questions were not included in this analysis due to errors on the test questions (1. The student will verify the Pythagorean Theorem by measuring and then applying the Pythagorean Theorem to find the missing length of a side of a right triangle when the lengths of the other two sides are given; and, 2. The student will graph a linear equation in two variables on the coordinate plane, using a table of ordered pairs.).

Eighth graders improved the most compared to their Columbus counterparts on the program intervention pre/post exam (See Table 9) They improved most in their understanding of gear ratio (#3), first step in designing a new product (#4) and gear motions (#5). Like the 6th and 7th graders, they improved more on the gear toy vocabulary than on the flight toy vocabulary. There was a positive mean difference between the pre and post-testing in each of the program/intervention sections, indicating that overall students improved.

Table 9
GRADE 8 – Comparison of Columbus Matched Pre and Post-test Scores
Program Intervention Math and Vocabulary (N = 44)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.11
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	72.7	63.6	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	79.5	86.4	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	52.3	68.2	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	52.3	72.7	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	59.1	75.0	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	36.4	50.0	
Vocabulary Matching 1 – 5 = Gear Toy / 5 – 10 = Flight Toy					
1	Sprocket		56.8	72.7	Overall Gear Toy Mean Difference .20
2	Gear Ratio		43.2	75.0	
3	Force		90.9	93.2	
4	Prototype		86.4	95.5	
5	Torque		38.6	81.8	
6	Aspect Ratio		27.3	36.4	Overall Flight Toy Mean Difference .08
7	Projectile		31.8	36.4	
8	Drag		50.0	56.8	
9	Pitch		15.9	41.9	
10	Mode		47.7	40.9	

Washington, D.C. Middle School Findings – Student Profile

Viable data were collected on 117 middle school students in the Washington, D.C. SEEK program: 61 sixth graders; 39 seventh graders; and, 17 eighth graders. Twenty-seven of the sixth graders are reported as returning students from the first program. The group had nearly three times as many males as females as shown in Table 10. Far fewer 8th graders than sixth and seventh graders are in this data sample.

Table 10 – DC Students by Grade and Gender⁸

	6 th grade	7 th Grade	8 th Grade	Total
Male	44	30	12	86
Female	17	9	5	31
Total	54	39	17	117

As in Columbus, the majority of participants indicated that they liked math and science. Table 11 presents data on these two variables by grade and gender.

Table 11 – DC Students Graders Who Like Math and Science by Grade and Gender

	% Likes Math			% Likes Science		
	6 th grade	7 th grade	8 th grade	6 th grade	7 th grade	8 th grade
Male	81.0	86.2	66.7	87.8	79.3	66.7
Female	78.6	62.5	100.0	78.6	71.4	33.3

Table 12 shows that many DC students had prior knowledge of engineers but they learned more about what engineers do as a result of their participation in SEEK.

Table 12 – DC Students Exposure to Engineers by Grade and Gender

% Indicating they knew an engineer prior to SEEK			% indicating they know what engineers do			
			Pre SEEK		Post SEEK	
	Male	Female	Male	Female	Male	Female
Grade 6	31.0	35.7	69.2	84.6	76.7	88.2
Grade 7	51.7	62.5	71.4	62.5	79.3	77.8
Grade 8	16.7	100.0	33.3	66.7	63.6	100.0

Sixths graders in DC performed slightly lower in the profile standards math questions than did Columbus 6th graders. Standards #8 and #2 posed similar difficulties for the Columbus and DC sample as the majority of students did not solve the problems successfully. Only half of the students were successful on the two questions where an understanding of converting meters to centimeters was required (Standard #5). The only standard where the DC students surpassed the Columbus students was #3. The majority of the students did correctly solve problems for standard #1, #3, #4, #6, and #7 as shown in Table 13. The profile of students who have completed the 6th grade in DC is: students like math and science; they are disproportionately male; and, a significant number have not mastered key math standards for their grade.

⁸ These numbers do not represent all of the students who participated in the Columbus program. It includes all of the student on which we have viable assessment data. They took the appropriate pre and/or post-test.

Table 13
GRADE 6 – DC Test Scores (Overall N = 54)
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	25% is ____ .25	$\frac{1}{100}$ ____ .01	The student will identify representations of a given percent and describe orally and in writing the equivalence relationship between fractions, decimals, and percents.	80.5	66.0
2	$\frac{1}{100}$ ____ $\frac{1}{10}$	$\frac{1}{1000}$ ____ $\frac{1000}{1}$	The student will compare and order whole numbers, fractions, and decimals, using concrete materials, drawings or pictures, and mathematical symbols.	31.7	46.2
3	On a time line the difference between -3 and 3 is ____.	The difference between 0 and 3 is ____.	The student will identify and represent integers on a number line.	80.5	66.0
4	$1\frac{2}{5} + 6\frac{4}{9} =$ ____.	$7\frac{16}{32} + 9\frac{2}{64} =$ ____.	The student will solve problems that involve addition, subtraction, and/or multiplication with fractions and mixed numbers, with and without regrouping, that include like and unlike denominators of 12 or less and express their answers in simplest form.	80.5	69.8
5	1 meter = ____ cm	10 meter = ____ cm	The student will compare and convert units of measures for length, weight/mass, and volume within the U.S. Customary system and within the metric system and estimate conversions between units in each system.	48.8	50.9
6	Which of the following is <u>not</u> a property of a square?	Which of the following is <u>not</u> a property of a rectangle?	The students will identify, classify and describe the characteristics of plane figures including similarities and differences.	65.9	54.7
7	Circle the pie chart showing that Harrison ate $\frac{1}{4}$ of the pizza?	Which pie chart shows that Harrison ate $\frac{1}{1}$ of the pizza?	The student, given a problem situation, will collect, analyze, display and interpret data in a variety of graphical methods, including line, bar, and circle graphs and stem-and-leaf and box-and-whisker plots. Circle graphs will be limited to halves, fourths, and eighths.	82.0	66.0
8	Which procedure could be used to find the value for x that will make the number sequence true? $8x = 40$?	Which procedure could be used to find the value for x that will make the number sequence true? $8x = 64$?	The student will solve one-step linear equations in one variable, involving whole number coefficients and positive rational solutions.	36.6	20.8

Washington DC Middle School Findings – Program/Intervention (7th and 8th grade profile)

The program intervention was successful for the 6th graders in Washington DC. Students performed better on all of the post-test questions as shown in Table 10. Their understanding of the vocabulary in the gear toy increased most of all, followed by their understanding of the standards problems. Although their pre-test scores were lower than their Columbus counterparts in these two areas, the difference between their pre and post scores in both of these areas exceeded the growth of the Columbus 6th graders. This was not true for the flight toy vocabulary where Columbus 6th graders had higher pre-test scores and a higher mean difference score. The scores in Table 14 indicate that students performed better after the SEEK program/intervention in all of the tested program/intervention areas.

Table 14
GRADE 6 – Comparison of Washington DC Matched Pre and Post-test Scores
Program Intervention Math and Vocabulary (N = 56)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.18
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	44.6	64.3	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	55.4	69.6	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	21.4	60.7	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	46.4	57.1	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	48.2	53.6	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	30.4	46.4	
Vocabulary Matching 7 – 11 = Gear Toy / 12 – 16 = Flight Toy					
7	Sprocket		28.6	78.6	Overall Gear Toy Mean Difference +.40
8	Gear Ratio		30.4	78.6	
9	Force		62.5	89.3	
10	Prototype		62.5	87.5	
11	Torque		33.9	83.9	
12	Aspect Ratio		17.9	27.3	Overall Flight Toy Mean Difference +.08
13	Projectile		23.2	27.3	
14	Drag		35.7	43.6	
15	Pitch		17.9	29.1	
16	Mode		21.4	29.1	

Seventh graders in this DC sample are disproportionately male. The majority indicate they like math and science with boys liking both subjects better than the girls. They also share that they know what engineers do. The majority of these 7th graders state they know an engineer. The profile for the 7th graders shows particularly weak mastery of the targeted math standards (See Table 15). Approximately half of the 7th graders have not mastered the targeted seven math standards. Like students in each of the other grades, writing and understanding an algebraic equation posed particular difficulty.

Table 15
GRADE 7 – Washington D.C. Test Scores
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	$\frac{64}{1} \text{ — } 8^2$	$\frac{1}{64} \text{ — } 8^2$	The student will compare, order, and determine equivalent relationships between fractions, decimals, and percents, including scientific notation.	72.4	52.6
2	$(81 \div 3^2 \bullet 6) - 32 + 7$	$[81 \div 3^2 (6 - 32)] + 7$	The student will simplify expressions by using order of operations, mental mathematics, and appropriate tools. Exponents will be included.	75.9	36.8
3	Nicole bought a dress at Macy's for \$24.00. If the sales tax is 5% and the local tax is 1%, what is the total tax paid for the dress?	Nicole bought a dress at Macy's for \$24.00. If the sales tax is 5% and the local tax is 1%, what is the total she paid for the dress?	The student will solve consumer application problems involving tips, discounts, sales tax, and simple interest, using whole numbers, fractions, decimals, and percents.	44.8	63.2
4	Keenan has a rectangular deck that is 17 feet long by 6.5 feet wide. If he wants to make the sides of rectangular deck 50% bigger, what are the new dimensions?	Keenan has a rectangular deck that is 17 feet long by 6.5 feet wide. If he wants to make the sides of the rectangular deck 100% bigger, what are the new dimensions?	The student will use proportions to solve practical problems, including scale drawings that contain whole numbers, fractions, decimals, and percents.	41.4	55.3
5	Takeisha has a marble bag with 3 blue marbles, 6 red marbles and 9 green marbles. What is the probability that she will pull out a <i>blue</i> marble?	Takeisha has marble bag with 3 blue marbles, 6 red marbles and 9 green marbles. What is the probability that she will pull out a <i>green</i> marble? A. 1 in 3	The student will determine the probability of a given simple event and express that probability as a ratio, decimal, or a percent as appropriate for the given situation.	44.8	39.5
6	What is the <i>mode</i> for this data set {2, 2, 5, 6, 8, 9, 22}?	What is the <i>median</i> for this data set {2, 2, 5, 6, 8, 9, 22}?	The student will create and solve problems involving the mean, median, mode, and range of a set of data.	58.6	78.9
7	Write the following as an algebraic expression: Jerome is 16.2 % taller than Amos.	Write the following as an algebraic expression: Jerome is 1.62 % taller than Amos.	The student will write verbal expressions/sentences as algebraic expressions/equations.	24.1	36.8

Regarding the program/intervention data, the 7th graders improved in each of the sixteen tested items as shown in Table 16. Gear toy vocabulary showed the greatest improvement between pre and post-testing, followed by the flight toy vocabulary with the standards questions showing the least overall improvement as measured by the mean difference between pre and post-testing.

Table 16
GRADE 7 – Comparison of Washington DC Matched Pre and Post-test Scores
Program Intervention Math and Vocabulary (N = 36)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.08
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	77.6	83.3	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	80.6	83.3	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	58.3	75.0	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	63.9	77.8	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	55.6	61.1	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	36.1	41.7	
Vocabulary Matching 7 – 11 = Gear Toy / 12 – 16 = Flight Toy					
7	Sprocket		63.9	83.3	Overall Gear Toy Mean Difference +.21
8	Gear Ratio		52.8	80.6	
9	Force		80.6	94.4	
10	Prototype		91.7	97.2	
11	Torque		50.0	86.1	
12	Aspect Ratio		22.2	44.4	Overall Flight Toy Mean Difference +.15
13	Projectile		50.0	58.3	
14	Drag		47.2	61.1	
15	Pitch		30.6	36.1	
16	Mode		27.8	52.8	

The 8th graders who took both the pre and post-test are the smallest DC sample (N = 17). They are overwhelmingly male. The responding girls in the sample share they know an engineer. The 8th grade girls all like math but fewer like sciences. Less than a fifth of the boys indicated they know an engineer and only a third of them shared they know what engineers do prior to SEEK. This number rose to two thirds for the boys and one hundred percent for the girls after SEEK. This pattern of increased awareness of

what engineers do was consistent across the board for SEEK attendees in DC. The 8th graders in this sample were also behind in their mastery of targeted math standards. This was particularly true for #2, understanding and use of exponents (See Table 17)

Table 17
GRADE 8 – Washington DC Test Scores (Overall N = 17)
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	Triangle A is 33% smaller than triangle B. What is the perimeter of Triangle A if the perimeter of triangle B is 59 cm?	Triangle A is 33% larger than triangle B. What is the perimeter of Triangle A if the perimeter of triangle B is 59 cm?	The student will use proportions to solve scale-model problems with fractions and decimals.	71.4	68.8
2	$10^3 - 10^2 =$	$10^3 + 10^2 =$	The student will simplify numerical expressions involving exponents, using order of operations.	28.6	37.5
3	Jose has been driving 64 miles per hour for 8 hours. If <i>distance = rate X time</i> , how far has she traveled?	Jelan has been driving 64 miles per hour for 10 hours. If <i>distance = rate • time</i> , how far has she traveled?	The student will solve practical problems involving whole numbers, integers, and rational numbers, including percents. Problems will be of varying complexities, involving real-life data.	86.7	81.2
4	Which is <i>not</i> a property of a pyramid?	Which is <i>not</i> a property of a cube?	The student will describe, classify, and construct plane figures and solid figures, including prisms, pyramids, cylinders, and cones.	57.1	81.2
5	What is the solution to $\frac{x}{6} + 12 = 18$?	What is the solution to $\frac{x}{6} + 20 = 26$?	The student will solve multi-step equations in one variable.	71.4	56.2
6	Create a pie chart showing the % of money that each sibling receives: Alisha 20%, Amber 30%, Ben 15 %, and Jose 35 %.	Create a pie chart showing the % of money that each sibling receives: Alisha 10%, Amber 30%, Benjamin 15%, and Deron 45 %.	The student will describe and represent relations using tables, graphs, and rules.	85.7	81.2

The sample size of 8th graders was extremely small. Thus, the data may not be representative of the entire 8th grade sample. However, the data on the eight 8th graders with pre and post-test data are consistent with the findings from all of the program/intervention data. They show improvement in the majority of the fourteen questions with the highest improvement in the gear toy vocabulary matching (See Table 18).

Table 18
 GRADE 8 – Comparison of Washington DC Matched Pre and Post-test Scores
 Program Intervention Math and Vocabulary (N = 8)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	Overall Program Intervention Standards Questions Mean Difference +.17
#	Multiple choice with four options		Pre-test	Post-test	
1	Circle the definition that best describes ratio.	Understand and apply learned mathematical concepts to solve real life problems	87.5	87.5	
2	When gear A below rotates one time, how many times does gear B rotate?	Understanding simple machines and analyzing the interrelationships of several variables	87.5	100.0	
3	If gear A is the driver gear, what is the gear ratio?	Understanding simple machines and analyzing the interrelationships of several variables	62.5	100.0	
4	What is the first step in designing a new product?	Formulating appropriate questions for scientific investigation	75.0	100.0	
5	Which of the following diagrams indicates the correct motion of the parts?	Understanding simple machines and analyzing the interrelationships of several variables	62.5	75.0	
6	In order for a glider to fly, its weight must be opposed by _____.	Understanding forces acting on moving object	12.5	25.0	
Vocabulary Matching 1 – 5 = Gear Toy / 5 – 10 = Flight Toy					
1	Sprocket		37.5	100.0	Overall Gear Toy Mean Difference .40
2	Gear Ratio		37.5	100.0	
3	Force		87.5	100.0	
4	Prototype		87.5	100.0	
5	Torque		50.0	100.0	
6	Aspect Ratio		62.5	75.0	Overall Flight Toy Mean Difference .05
7	Projectile		50.0	62.5	
8	Drag		75.0	62.5	
9	Pitch		37.5	25.0	
10	Mode		12.5	37.5	

Washington DC Elementary School Findings – Student Profile

Viable data were collected on 147 students in the Washington, DC elementary program: 54 third graders; 57 fourth graders; and, 36 fifth graders. The group was also disproportionately male as seen in Table 19.

Table 19 – DC Elementary Students by Grade and Gender⁹

	3 rd Grade	4 th Grade	5 th Grade	Total
Male	40	29	23	92
Female	14	28	13	55
Total	54	57	36	147

As in the middle schools, the majority of participants in each grade level indicated that they liked math and science (See Table 20). They liked it for a variety of different reasons but the majority said because it was fun and easy. They also share:

- Because I like numbers.
- Because you learn a lot of cool things.
- I am good at it.
- I am good at it.
- I like math because its fun and you learn neat stuff.
- Its fun and I know math.
- Yes because on my report card I get A's and B's on my report card in math and math is an important subject to learn.
- Math can help you when go to college.
- I like math because of all the ways that you can solve problems.
- Because if I go to the store I want to know how much change I get.
- Because you'll need it when you get older.
- I like math because I like to challenge myself to the hard equations.
- I like math because it is interesting and doing math problems is fun.

On the other hand, like the middle school students, most of the students who didn't like math shared that they felt it was boring and hard:

- I don't like it because of the homework and I don't know my facts.
- It's boring and I fall asleep.
- No, because it's hard for me and I need to do it every day. Even in the summer.
- It's too hard.
- No because its very hard and frustrating
- I do not like math because I suck at math I also don't know that much of math..

⁹ These numbers do not represent all of the students who participated in the Washington DC program. It includes all of the student on which we have viable assessment data. They took the appropriate pre and/or post-test. There were a few students who were just going into the 2nd or 3rd grade who were too young for the sample and were also not included.

Table 20 – DC Elementary Students Who Like Math and Science
by Grade and Gender¹⁰

	% Likes Math			% Likes Science		
	3 rd grade	4 th grade	5 th grade	3 rd grade	4 th grade	5 th grade
Male	86.1	61.5	82.6	75.7	76.9	91.3
Female	78.6	80.0	69.2	85.7	64.0	76.9

The students who indicated they like science mainly because they perceive it as fun and interesting and many like to do experiments:

- I like science because you get to do cool experiments.
- You get to dissect stuff and eat it! and experiments.
- Yes because science has to do with a lot of thing I like.
- Because it teaches your about animals, electricity, and the earth.
- You get to learn about nature.
- It's COOL!
- Because it is like working into a jungle then walking back to the city and back again.
- You can discover and create things.
- I love science! My teacher makes it fun for everybody in the class.
- Science is fun it's just like making robots; science is fun.
- I am very good at science and I'm a crazy scientist.
- Yes because some times you can blow up things.
- It helps me to become a scientist.
- Because it is interesting and amusing.

Once again, like the middle school students, those who do not like science think it is boring, difficult to understand and not very much fun. Additional reasons they offered include:

- No, I don't like science because I get basically C's in science and to me it's not good and in school you learn about minerals it's hard to remember.
- I get bored.
- There is nothing fun to do.
- It's hard to understand.
- Because I don't get it.
- No, because science is my worst subject I always get straight A's but in science I get a B.
- Because it is boring. But I like SEEK.

Data presented in Table 21 show that some participants knew engineers prior to their coming to SEEK. However, their knowledge of what engineers do increased over the course of the program for the vast majority of students. This trend across the full sample of participants shows that NSBE was successful in reaching the program goal of exposing young students to the STEM areas

¹⁰ Data in Tables 2 and 3 are the valid percents. In some cases students did not answer the question and are not included in these tables.

Table 21 – DC Elementary Student Exposure to Engineers by Grade and Gender

% Indicating they knew an engineer prior to SEEK			% indicating they know what engineers do			
			Pre SEEK		Post SEEK	
	Male	Female	Male	Female	Male	Female
Grade 3	44.7	21.4	57.9	42.9	52.0	57.1
Grade 4	34.6	44.0	50.0	84.0	93.8	81.0
Grade 5	47.8	50.0	60.9	50.0	73.7	83.3

Elementary students had interesting ideas about what engineers do. Some knew about specific engineers and others had general views of the work of engineers:

- Engineers build stuff like robots, cars, phones and cell phones.
- Engineers work on buildings, save people's lives and design cars. They also do more.
- They create and design new things such as computer games and computers
- They make things better and fix things
- Build and test models of different objects
- Some engineers for example build roller coasters for theme parks.
- Engineers are people who work and steer trains
- I know what some engineers do stuff that helps to improve things and make the world better

Assessing where our students are academically will help SEEK continuously improve the program by being able to develop training and curriculum that target the specific needs of our participants. This year assessments to create profiles of participating students were introduced. Tables 22, 23 and 24 present the percentage of students who correctly answered standards based questions for the grade they had just completed. Thus, 75% indicates that for the standard being assessed, 75% of the students showed mastery by answering correctly the question associated with the standard. Profile questions were asked on both the pre and post-test. Thus, students had the opportunity to show mastery twice. There was not an expectation that students would perform better on one or the other time of testing.

Table 22 shows that for third graders (students going into the 4th grade) over sixty percent of the students correctly answered all of the standards based questions. However on some of the problems, students did better. For example, over ninety percent were able to recognize and use the inverse relationship between addition/subtraction to complete basic fact sentences (See #2 in Table 22).

Table 22
GRADE 3 –DC Elementary Test Scores (Overall N = 54)
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	An elementary school read 27,543 books. What is the value of the 2 in 27,543?	1. An elementary school read 27,543 books. What is the value of the 5 in 27,543?	The student will read and write six-digit numerals and identify the place value for each digit.	79.2	82.1
2	$2 + 6 = 8$ and $8 - 2 = \underline{\quad}$.	$7 + 3 = 10$ and $10 - 3 = \underline{\quad}$.	The student will recognize and use the inverse relationships between addition/subtraction to complete basic fact sentences.	93.8	96.4
3	7 times 8 = $\underline{\quad}$.	9 times 3 = $\underline{\quad}$.	The student will recall the multiplication and division facts through the nines table.	79.2	82.1
4	Clarence has two one-dollar bills, three quarters, seven dimes, nine nickels and three pennies in his pocket. How much money does Clarence have?	Clarence has three one-dollar bills, five quarters, two dimes, sixteen nickels and seven pennies in his pocket. How much money does Clarence have?	The student will add and subtract with decimals expressed as tenths, using concrete materials and paper and pencil.	62.5	67.9
5	A clock on the wall reads 3:20 p means the minute hand is on the	The clock on the wall reads 6:20 pm. The minute hand on an analog clock would be on the $\underline{\quad}$.	The student will tell time to the nearest five-minute interval and to the nearest minute, using analog and digital clocks.	72.3	67.9

Forth graders, did not perform as well as the third graders (See Table 23). These data show that approximately two thirds of the forth graders may be on grade level on the standards tested. The elementary students did slightly worse at each higher grade level as the fifth grades percentage correct level was lower than the forth. Fifth graders performed poorly on computational questions. Their lowest score was on the question which required them to write an open ended sentence, using a variable to represent a given mathematical relationship (See Table 24, question #6)

Table 23
GRADE 4 –DC Elementary Test Scores (Overall N = 57)
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct Time 1	% Correct Time 2
	Time 1	Time 2			
1	One half ____ four eighths	three sixths ____ four sixths	The student will compare the numerical value of fractions having denominators of 12 or less.	65.3	79.4
2	Elijah has three toy boxes. Box A has 22 toys. Box B has 42 toys. Box C has 65 toys. The difference between Box C and Box A is between ____ and ____.	Elijah has three toy boxes. Box A has 35 toys. Box B has 43 toys. Box C has 73 toys. The difference between Box C and Box A is between ____ and ____.	The student will estimate whole-number sums and differences and describe the method of estimation. Students will refine estimates, using terms such as closer to, between, and a little more than.	49.0	76.5
3	624 times 47 = ____.	492 times 36 = ____	The student will find the product of two whole numbers when one factor has two digits or less and the other factor has three digits or less, using estimation and paper and pencil.	61.2	79.4
4	64 divided by 4 = ____.	48 divided by 4 = ____	The student will estimate and find the quotient of two whole numbers given a one-digit divisor.	69.4	82.4
5	.090 - .062 = ____.	.088 minus .054 = ____.	The student will add and subtract with fractions having like and unlike denominators of 13 or less and with decimals through thousandths, using concrete materials and paper and pencil.	83.7	85.3
6	Grace is 3 feet tall. Gary is 4 feet tall. In the box below display their heights using a line or bar graph and using increments of one (foot).	Grace has five dolls. Ginny has 9 dolls. In the box below display their number of dolls using a line or bar graph and using increments of one.	Able to collect, organize, and display data in line and bar graphs with scale increments of one or greater than one	67.3	82.4

Table 24
GRADE 5 –DC Elementary Test Scores (Overall N = 36)
Targeted Math Standards

#	Question/Problem Multiple choice with four options		Math Standard	% Correct	% Correct
	Time 1	Time 2		Time 1	Time 2
1	What is the value of the 3 in 7496.0235?	What is the value of the 2 in 7496.0253	The student will read, write and identify the place values of decimals through ten-thousandths.	41.9	71.0
2	.0762 ____ .7627	.9158 ____ .1958	The student will compare the value of two decimals through ten-thousandths using the symbols >, <, or =.	74.2	77.4
3	650,000 divided by 500 = ____	550,000 ÷ 200 = ____	The student will create and solve problems involving addition, subtraction, multiplication, and division of whole numbers, using paper and pencil, estimation, mental computation, and calculators.	58.1	35.5
4	.325 times .79 = ____	.7191 times .62 = ____	The student will find the product of two whole numbers expressed as decimals through thousandths, using an appropriate method of calculation, including paper and pencil, estimation, mental computation, and calculators.	51.6	58.1
5	Diameter of a circle = 2 • radius. What is the diameter of a circle whose radius is 6 cm?	Diameter of a circle = 2 • radius. What is the diameter of a circle whose radius is 2.7 cm?	The student will identify and describe the diameter, radius, chord and circumference of a circle.	80.6	58.1
6	Which equation best expresses the statement: <i>Ronnie has six more tickets than Connie.</i>	Which equation best expresses the statement: <i>Ronnie has six less tickets than Connie.</i>	The student will write and open sentence, using a variable to represent a given mathematical relationship	12.9	38.7
7	Use the graph below to answer questions 7 and 8. What is the approximate height and width of point A	(another graph shown for use to answer 7 and 8) What is the approximate height and width of point B	The student will identify the ordered pair for a point and locate the point for and ordered pair in the first quadrant of a coordinate plane.	48.4	87.1
8	How much shorter is point A compared to point B?	How much shorter is point A compared to point B?	The student will read and interpret data represented in bar and picture graphs.	64.5	41.9

Washington DC Elementary School Findings – Program/Intervention

The standards and the vocabulary that targeted the program or intervention activities were part of the pre and post-test for students. Table 25 through 27 present these data by grade. The overall results indicate that students in each grade performed better on the post-test than the pre-test on these same items. This is a positive trend for all SEEK participants. A specific 'toy' vocabulary test was given as a pre and post-test each week for the elementary students. For example, ten vocabulary matching questions from the jet toy curriculum were given at the beginning of the jet toy challenge and again at the end of the week prior to students moving to the next challenge (skimmer or steel can rover). Teachers graded the pre and post-test and gave total scores. Thus, the elementary data differs from the middle school data in that total scores are reported instead scores for each individual word.

The mean difference for the third graders was +.25 which shows that the average correct scores from the six post-test items compared favorably (students improved) to the average scores of the same six pre-test items. The only item where improvement was not shown was on the concept of symmetry (#4) where students performed slightly lower in the post-testing. The vocabulary result show that students also improved. This improvement was greater for the skimmer and steel can rover than the jet toy for third graders.

Forth grader mean difference was +.26 on the program intervention standards. They had the highest improvement in understanding the concept and calculations necessary for solving the diameter problem. Students moved from 55.2% to 85.8% getting this problem correct. However, fewer students were able to master how to solve the surface calculation problem (See Table 26). They improved on all other test questions including the vocabulary. In the vocabulary section, they started off higher than the third graders however they showed less improvement.

The fifth graders improved from pre to post-testing. They showed lower improvement than their third and forth grade counterparts on both the standards and vocabulary sections. The item which reduced their mean difference score on the program intervention standards (+.18) was their ability (or perhaps their desire at the post-test) to create a graph. Their test scores stayed the same or improved on all other items but dropped significantly on the graph item. They had the highest pre-test scores on the vocabulary so they had a smaller range for improvement (See Table 27). However, they did improve on all items indicating that most of them knew all of the skimmer vocabulary words (post mean score 9.67 of ten) and all of the steel can rover (post mean score 9.22) vocabulary words, plus, the majority of the jet toy vocabulary words (post mean score 8.50).

Table 25
 GRADE 3 – Comparison of DC Elementary Matched Pre and Post-test Scores
 Program Intervention Math and Vocabulary (N = 30)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	
#	Multiple choice with four options		Pre-test	Post-test	
1	Alicia has lots of bicycle parts. She wants to build something new with the parts. What is the first thing Alicia should do?	Apply scientific understanding to a design problem	66.7	66.7	Overall Program Intervention Standards Questions Mean Difference +.25
2	Picture on right. What force acts to pull Chris down the ramp once he begins his downward motion?	Understand forces acting on moving object	76.7	86.7	
3	Picture of Skimmer with measurement on right. What is the surface area of the Skimmer sail to your right?	Identify a simple problem; formulating appropriate question for scientific investigation.	3.3	26.7	
4	Circle the shape below that does not have symmetry.	Understand shapes	76.7	73.3	
5	Graph displayed for answering 5 and 6. How many times wind-up turns can you make using a Steel Can Rover with 8 washers in the ballast?	Read and interpret data represented in bar and picture graphs. Formulate appropriate questions for scientific investigation; interpret scientific evidence.	30.0	43.3	
6	How many washers do you need so that you can make 60 wind-up turns?	Read and interpret data represented in bar and picture graphs. Formulate appropriate questions for scientific investigation; interpret scientific evidence.	50.0	63.3	
Vocabulary Matching – Tests were taken each week. Scores represents the cumulative mean score of two sets of vocabulary matching; total possible 10 (N = 41)					Mean Difference
7	Skimmer		6.35	8.68	+2.33
8	Jet Toy		5.00	6.73	+1.73
9	Steel Can Rover		4.88	7.39	+2.51

Table 26
 GRADE 4 – Comparison of DC Elementary Matched Pre and Post-test Scores
 Program Intervention Math and Vocabulary (N = 29)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	
#	Multiple choice with four options		Pre-test	Post-test	
1	Alicia has lots of bicycle parts. She wants to build something new with the parts. What is the first thing Alicia should do?	Apply scientific understanding to a design problem	79.3	72.4	Overall Program Intervention Standards Questions Mean Difference +.26
2	What is the diameter of the circle below?	Able to identify and describe the diameter, radius, chord and circumference of a circle.	55.2	82.8	
3	Picture of Skimmer with measurement on right. What is the surface area of the Skimmer sail to your right?	Identify a simple problem; formulating appropriate question for scientific investigation.	58.6	48.3	
4	Test has picture on right Chris pushes off the ramp platform with his right foot. He quickly places his foot back on the board and rides down the ramp. What force acts between Chris's foot and the platform as he pushes off?	Understand forces acting on moving object	44.8	51.7	
5	Test has picture on right. What force acts to pull Chris down the ramp once he begins his downward motion?	Understand forces acting on moving object	79.3	89.7	
6	Graph displayed for answering 5 and 6. How many times wind-up turns can you make using a Steel Can Rover with 8 washers in the ballast?	Read and interpret data represented in bar and picture graphs. Formulate appropriate questions for scientific investigation; interpret scientific evidence.	62.1	72.4	
7	How many washers do you need so that you can make 60 wind-up turns?	Read and interpret data represented in bar and picture graphs. Formulate appropriate questions for scientific investigation; interpret scientific evidence.	69.0	82.8	
Vocabulary Matching – Tests were taken each week. Scores represents the cumulative mean score of two sets of vocabulary matching; total possible 10 (N = 46)					Mean Difference
7	Skimmer		7.98	9.58	+1.60
8	Jet Toy		6.20	7.72	+1.52
9	Steel Can Rover		7.20	8.96	+1.76

Table 27
 GRADE 5 – Comparison of DC Elementary Matched Pre and Post-test Scores
 Program Intervention Math and Vocabulary (N = 31)

	Question/Problem (Same for pre and post-tests)	Standard	% Correct	% Correct	
#	Multiple choice with four options		Pre-test	Post-test	
1	Test has picture on right Chris pushes off the ramp platform with his right foot. He quickly places his foot back on the board and rides down the ramp. What force acts between Chris's foot and the platform as he pushes off?	Understand forces acting on moving object	54.8	64.5	Overall Program Intervention Standards Questions Mean Difference +.18
2	Test has picture on right. What force acts to pull Chris down the ramp once he begins his downward motion?	Understand forces acting on moving object	90.3	90.3	
3	Alicia has lots of bicycle parts. She wants to build something new with the parts. What is the first thing Alicia should do?	Apply scientific understanding to a design problem	64.5	77.4	
4	Test has picture on right. To the right is a picture of a staircase. A staircase is most like what type of simple machine?	Understanding simple machines	51.6	58.1	
5	In the space below graph Bill's progress of tests scores listed by trimester using scale increments of 10%. Trimester 1 = 70%, Trimester 2 = 80%, Trimester 3 = 90% .	The student will collect, organize, and display a set of numerical data in a variety of forms, given a problem situation, using bar graphs, stem-and-leaf plots, and line graphs.	61.3	29.0	
Vocabulary Matching – Tests were taken each week. Scores represents the cumulative mean score of two sets of vocabulary matching; total possible 10 (N = 34)					Mean Difference
7	Skimmer		8.76	9.67	+ .91
8	Jet Toy		7.35	8.50	+1.15
9	Steel Can Rover		7.94	9.22	+1.28

Section 2 – Mentor/Staff and Parent Data

Mentors in the SEEK program were mainly NSBE college students. A few NSBE advisors and other students, who had heard of the program from the previous year, also participated as 2008 SEEK mentors. Although introducing the middle and high school students to STEM activities and career paths through an exciting ‘hands-on’ approach is a major emphasis of SEEK, exposing them to African American role models is also a priority. Parent feedback in the first year of the program emphasized how important it was for their children to see a large group of successful African American college students. Having these college students as role models allowed their children to see the possibilities for themselves. The following excerpts are taken from the 2007 SEEK parent focus group report:

- “My children now see a broader definition of success”
- “My child is much more self-confidence and her self-esteem is higher.”
- “My daughter shared, ‘Now I know what I want to do’.”
- “Exposure to college students and other aspects of collegiate life was so helpful and positive for our children to see.”
- “My child now sees that education and being smart are cool and fun.”

In addition, facilitating college students in their own self development by serving their community as mentors to pre-collegiate students, is also a SEEK objective consistent with the NSBE mission.

The mentors receive four days of training prior to each SEEK camp. The first two days focus on self-development through understanding issues of race, identity, normal child development and classroom strategies. It also gave mentors a chance to get to know one another. The second two days focus on learning the SAE curriculum and participating in the athletic Grades to Games training. At the end of training mentors were asked to submit training evaluations. The evaluation forms were to be accessible on line. However, there were many complications and many students were unable to submit their forms on line in the dormitories. Some students were able to later access the forms, download and submit them. Others received hard copies from NSBE staff members and submitted them during the first week of class. Overall, we received 77 training evaluation forms (64% response rate).

As Tables 28 – 33 show, the mentors rated their training positively. Columbus mentors rated their training more highly than the mentors trained in DC. This may have been due to a variety of factors. Their training was new to most of the Columbus mentors as there were only a few returning mentors. DC had more returning mentors who had already gone through the first two days of training. Also, the meal process and transportation went far more smoothly in Columbus. The facilities were also nicer in Columbus. A listing of what mentors liked and disliked about the training is presented in Tables 34 and 35.

Table 28 – Overall mentor workshop ratings

We would like your feedback on our training so that we can improve in the future. Your feedback really counts, so please let us know if you agree or disagree with the following statements about the overall training	Agree	Disagree	Not applicable/ No Answer
Total N = 77	%	%	%
1. The information presented was helpful.	95	3	3
2. I learned valuable new information.	92	7	1
3. I actively participated in the workshops.	97	3	0
4. The presenters were engaging.	92	8	0
5. The materials used were helpful and useful.	91	9	0
6. The level of the workshops was just right for me.	90	8	3
7. The pace of the workshop was good.	71	27	0
8. The workshops were well organized.	84	14	1

Table 29 – Overall mentor ratings of specific sessions

Total N = 77	% + Response	% OK	% – Response	N/A
9. Day 1, Part 1 – Background/MEES	77	18	4	1
10. Day 1, Part 2 – Affirmative Development Environment	75	20	3	3
11. Day 2, Part 1 – Mentoring	86	14	0	0
12. Day 2, Part 2 – The Grades Plus Games Training	91	8	1	0
13. SAE Training	89	9	0	1
14. Rate Overall Training	85	13	0	3

Table 30 – Columbus, OH mentor workshop ratings

We would like your feedback on our training so that we can improve in the future. Your feedback really counts, so please let us know if you agree or disagree with the following statements about the overall training	Agree	Disagree	Not applicable/ No Answer
Total N = 36	%	%	%
1. The information presented was helpful.	97	3	0
2. I learned valuable new information.	94	3	3
3. I actively participated in the workshops.	97	3	0
4. The presenters were engaging.	97	3	0
5. The materials used were helpful and useful.	100	0	0
6. The level of the workshops was just right for me.	97	3	0
7. The pace of the workshop was good.	86	14	0
8. The workshops were well organized.	92	6	3

Table 31 – Columbus, OH mentor ratings of specific sessions

Total N = 36	% + Response	% OK	% – Response	N/A
9. Day 1, Part 1 – Background/MEES	97	3	0	0
10. Day 1, Part 2 – Affirmative Development Environment	92	6	0	3
11. Day 2, Part 1 – Mentoring	91	8	0	0
12. Day 2, Part 2 – The Grades Plus Games Training	95	6	0	0
13. SAE Training	91	6	0	3
14. Rate Overall Training	100	0	0	0

Table 32 – Washington, DC mentor workshop ratings

We would like your feedback on our training so that we can improve in the future. Your feedback really counts, so please let us know if you agree or disagree with the following statements about the overall training	Agree	Disagree	Not applicable/ No Answer
Total N = 41	%	%	%
1. The information presented was helpful.	93	5	2
2. I learned valuable new information.	90	10	0
3. I actively participated in the workshops.	98	2	0
4. The presenters were engaging.	88	12	0
5. The materials used were helpful and useful.	83	17	0
6. The level of the workshops was just right for me.	83	12	5
7. The pace of the workshop was good.	59	42	0
8. The workshops were well organized.	78	22	0

Table 33 – Washington, DC mentor ratings of specific sessions

Total N = 41	% + Response	% OK	% – Response	N/A
9. Day 1, Part 1 – Background/MEES	58	32	7	2
10. Day 1, Part 2 – Affirmative Development Environment	61	32	5	2
11. Day 2, Part 1 – Mentoring	80	20	0	0
12. Day 2, Part 2 – The Grades Plus Games Training	88	10	2	0
13. SAE Training	88	12	0	0
14. Rate Overall Training	71	24	0	5

Table 34 – What Mentors liked about SEEK Training

Columbus Mentors	Washington, DC Mentors
• I like that the training is hands-on and I really feel like a teacher • A lot of hands-on activities...covering a lot of material but also taking time out for games. I also liked after SAE training seeing everyone have to teach a portion of an activity. I feel this training goes beyond just this camp but will help us in our daily lives. • The actual in-class SAE training that allowed for us to be taught and teach in a real-life setting provided us with more knowledge than just the ability to build the vehicle. • I liked most interacting and getting to know everyone. It gave me a sense of connection so that we can all depend on each other when needed without feeling uncomfortable. • The opportunity to lay hands-on sophisticated equipment • My favorite day of training was on Thurs. We had to present different concepts and materials to the class. It was great because I was given the chance to teach, work as a team and learn from the other groups. • I think it is wonderful training, It makes you engage with people and what it takes to give back to your community. Also to positively impact the community. • I liked the SAE training the most. This is because our teacher was approachable and entertaining. And the work we did was fun while knowledgeable. The games were also fun. Dr. Grace was also nice to listen to because she is very fun and exciting when it comes to teaching us. • The enthusiasm of each instructor was very contagious and although the days were long, the spirit kept me engaged. It would be great to have some activities or down time outside or switch the atmosphere each day during training - gym, cafeteria, outside, that way people are familiar with the settings of the school and learn the necessary content. • What I liked about the training was Dr. Carroll's input on how to deal with the children. Mrs. Dee also helped be prepared for the students by knowing what they will focus on and lose attention. • What I liked most about the training is the ice breakers. Interacting with the other mentors made me feel relaxed • Learning the G-2 games and all the exercises done to help us get to know one another. • What I liked most about the training was that mentors participated actively from the beginning to the end of the whole process • There was a lot of background information on the type of students as well as issues that would effective them. Also we were given helpful strategies for dealing with classroom behaviors. It was good that we were able to simulate the classroom setting • I liked the enthusiasm of the trainers and how excited they made me feel about the camp	• G-2, and learning that no kid is bad • I liked that we were able to be active in learning our projects • The best part of training was having us teach in our individual classrooms because it gave the mentors a chance to read the lesson. It also allowed mentors to laugh and bond with each other • The SAE training - good teacher (Herbert) he inspired us about the field of education • I like the fourth day the best because we were working hands-on and the contests. • I like the attitude that the trainers had upon us. They created a positive atmosphere • Being taught these lessons and ways break them down in ways that would be understood by young kids • The G-2 Games and meeting Dr. Carroll • The training actually provided us with useful techniques to use in the classroom, ranging from how to equally separate the kids, how to keep them in order and certain downtime activities • Dr Carroll's part was engaging, but most of the things she talked about were unnecessary things...racism and adapting to schools. But overall all she talked about helped me better myself but not how to deal with kids of the age you are dealing with. I wish it could be shorter and straight to the point. • I liked the SAE training. It was very enlightening and interesting • The personal interactions • Dr. Carroll's training was informative as usual. The G-2 training was great experience. I always enjoy seeing my old mentor from last year and meeting the new mentors • The Grades Plus Games training • Practice teaching was the best part of the training • The training with SAE because it was practical and directly related • The training really gave me some great advice on how to interact and keep the children alert while still having fun teaching

Table 35 – What Mentors disliked about the SEEK Training

Columbus Mentors	Washington, DC Mentors
• The equipment was faulty • The only thing I didn't like about the training was how short it was. I wanted to be confident and well-prepared when I start training the kids. • Being that this is my second year with SEEK the first couple of days of training was old to me. I still knew the majority of the material, but it still refreshed my memory. • What I didn't care for was how late the material came. • I didn't think there was anything unsatisfactory • It was crammed for time • The lunch time when we have the same meal at lunch without activities. • The meals provided • There isn't anything I disliked or like the least about any of the training. Great Job! • What I liked least about the training was the long hours we spent seated, but due to the amount of material that needed to be covered it was inevitable. • Given the circumstances, I understand that materials were not available - this really compromised the learning process. Breaks-activities should be built in. It became somewhat difficult to be lectured to more involvement would help. • Too much talking but that is only because I've heard most of it before • I believe the program is well organized, it also helps to learn what it takes to be a science and engineering. • The training was very helpful with helping us to know how and what to do with the students. I can't think of a thing I like least. • I liked the fact that SAE International stall came prepared and ready for this pioneer program at Columbus Ohio. • Getting binder and other training material late. • Insufficient time to cover G-2 material • I feel that it was a little unorganized at first, but it came together towards the middle of the week. • waking up early • I would want the training to have run for more days or weeks. • Too much information in short space of time. It was hard to feel prepared.. • The first part of training for the glider was confusing but it was clarified • The MEES training. The training needed more breaks or co-operative activities during second session. It is unfortunate that the average person was losing focus or sleeping after 20 minutes of continuous instruction. • There is a lot of information to cover in a short amount of time. • Shorter, straight to the point. I would be more optimistic and well rested so my attitude would be that of a more lively person, then that of a tired person. • I did not like to hear others constantly talking when the instructors was speaking, or students texting or sleeping • The 1st day with SAE. Dee just jumped in and started talking; I didn't know what she was talking about. Last year the instructors said clearly "I'm going to teach you like you're going to teach the students". That was clear.	• The equipment was faulty • The only thing I didn't like about the training was how short it was. I wanted to be confident and well-prepared when I start training the kids. • Being that this is my second year with SEEK the first couple of days of training was old to me. I still knew the majority of the material, but it still refreshed my memory. • What I didn't care for was how late the material came. • School environment and strategies • I didn't think there was anything unsatisfactory • It was crammed for time • The lunch time when we have the same meal at lunch without activities. • The meals provided • There isn't anything I disliked or like the least about any of the training. Great Job! • The 1st day background/MEES. It was valuable but extensive and boring • We needed a facility other than the gym. It was too hard to hear • What I liked least about the training was the long hours we spent seated, but due to the amount of material that needed to be covered it was inevitable. • Given the circumstances, I understand that materials were not available - this really compromised the learning process. Breaks-activities should be built in. It became somewhat difficult to be lectured to more involvement would help. • Too much talking but that is only because I've heard most of it before • The sound in the gym was horrible. I could really hear Dr. Grace Carroll • I believe the program is well organized; it also helps to learn what it takes to be a science and engineering. • Too long • The training was very helpful with helping us to know how and what to do with the students. I can't think of a thing I like least. • I liked the fact that SAE International stall came prepared and ready for this pioneer program at Columbus Ohio. • Getting binder and other training material late. Insufficient time to cover G-2 material • Environment • I feel that it was a little unorganized at first, but it came together towards the middle of the week. • Waking up early • I would want the training to run for more days or weeks.

Mentors, like their students appreciate ‘hands-on’ training and teaching. They, too, don’t like being lectured. A few felt that the training on race as it relates to the schooling of young children (MEES training) was not directly linked to the task of SEEK and should be minimized to leave room for direct classroom training. The facility for training in Washington, DC, the gym, was thought to be a barrier. Overall areas where there were recommendations for improving the training include; shorter (and longer); better organized; less equipment failure; more ‘hands-on’; more directly related to classroom; materials sent prior to training; different levels of training for those who had been previously trained; better facilities; better food; and more interaction. Some of the mentors’ specific suggestions for improvement will be included in the recommendations section of this report.

Student Reflections

Mentors were asked to write reflections on their students to document their experiences and the progress of their students. Some submitted three reflections, one for each week of student participation. Others submitted one or two.¹¹ Mentors were provided the following five guide questions to frame their reflections:

1. Was the student actively engaged in tasks?
2. What type of affect did the student exhibit?
3. Did the student encounter any problems (social or academic)?
4. What assets did the students bring to the group?
5. What would you have changed to make the week better for the student?

In Columbus one to three reflections were submitted on 197 different students. In them mentors shared their insights about the students’ behavior, experience and contributions to the group. Regarding engagement, mentors indicated that 139 of the students were engaged throughout their attendance in the SEEK camp (71%). There were twelve students who were described as participating most of the time (6%); thirty two students who received at least one sometimes engaged description of their participation (16%); and, fourteen students received a no engagement description (7%).

Engaged students at each site were described as being very much involved in the tasks and excited by the day to day program activities. Although all were not on target academically they wanted to participate. Mentors described engaged students as having the following assets:

- Determination
- Hard working
- Fun to be around
- Academically curious
- Creativity
- Catching on easily
- Receptivity
- Good at following directions
- Able to pay attention
- Confidence
- Positive attitude
- Works well with others

¹¹ An electronic file of reflections for both DC and Columbus is housed at NSBE. It is organized by student and mentor names.

- Very mature
- Self starter
- Always willing to work put talkative
- Showed great energy
- Bright with in depth insight on theory
- Helped others get things done

Although most of the engaged students were generally described as not having academic or social problems, there were a few who had problems understanding the materials and a few who were described as 'socially challenged' but with help were able to get the assignments done. Some actively engaged student needed encouragement and confidence building. Others were described as getting more actively engaged as the weeks progressed. However, a common theme of the actively engaged students is that they truly wanted to be at the camp and were able to take instruction. In informal interviews mentors described how they were able to really "connect" with their students and wanted to have more one-on-one time. The following sample of mentors' responses in their reflections of whether the student was engaged, provide insights on how participating students came with a wide range of experiences, attitudes, skills, potential and abilities.

- Yes actively engaged; brought leadership and determination; needed help w/academics but w/helping hand accomplished well; had different ideas;
- Yes student actively engaged; still socially challenged but very smart and receptive; pays attention and follow directions; I would have more "self" projects or better peer placement
- Yes actively engaged; smart with no social/academic problems; brought knowledge and understanding of the material; I would have more in depth projects and assignments.
- Yes actively engaged; good affect on group; social problems; brought ideas/good initiative;
- Yes actively engaged; showed she was very interested and wiling to help; positive affect; had a little problem with math; a team player;
- Actively engaged; exhibited leadership role; kept him separated from another student to prevent a fight; brought teamwork and leadership
- Yes actively engaged; great attitude; had trouble understanding concepts; always willing to try; I would have liked more time to be able to move slower.
- Yes actively engaged; catches on easy; exhibited determination; [I would have liked] have more one on one time.
- Majority of the time actively engaged; no social/academic problems; brought leadership and new ideas; I would have [liked to] challenged him more, very smart student.

- Most of the time [the student] was actively engaged; had a lot of confidence in himself but he would lose it easily if he couldn't do something the first time around; was always getting into arguments with the other boys in trying to prove himself. Due to that, he got off track very easily but was still able to maintain his motivation. He was ridiculed a good amount but provoked it 99% of the time; helped get the work done and maintained the light atmosphere
- Most of the time actively engaged; sometimes positive/negative affect; quick to get upset in small arguments; helped to get things done; no changes
- Sometimes [student was actively engaged]. He would get distracted extremely easily; he knows that he has the potential but he lets himself get distracted too easily; was always getting into something. His behavior improved since the first week but he still has some ways to go. He craves attention so he's always doing something he's not supposed to in order to get the other student's riled up. However, he would still be respectful to us when reprimanded unlike others; while he did distract the group and got distracted easily he was very motivating; I tended to give him personal tasks to keep him doing something so he wouldn't have the time to distract others
- Sometimes [she was] actively engaged; she was only girl in her group which had lack of leadership; seemed quiet at times; takes charge as a leader; brought creativity to group;
- Sometimes actively engaged; participated; talked too much or didn't feel like working; had some great ideas;
- Sometimes was actively engaged; quiet/attitude; smart does her part; I would have liked to have had more free time or social time so that she doesn't get bored.
- No student was not actively engaged; kept others from learning very disrespectful;

Students, who were described as being engaged most of the time, also exhibited many of the assets that engaged students did. However, they frequently were described as having problems with controlling their emotions as indicated by the following two examples:

- [Student] has lots of confidence but loses it easily if he couldn't do something.
- [Student] is quick to get upset and start arguments, but does help get things done.

This lack of focus is even greater for those students who were described as being engaged only sometimes. Mentors shared the following about these students:

- Distracts very easily
- Doesn't like participating

- Always getting into something
- Distracts the group
- When upset, gets off track
- Didn't want to participate with others
- Wanted to slack off when he didn't understand something
- Had a lot of attitude
- Craves attention

Of the fourteen students described as not being engaged, one was dismissed from the program by the site administrator; one was described as having attention deficit problems; one was described as really not wanting to be at the camp; and, most were described as being a great distraction for the other students as the mentor share the following about these students:

- Kept others from learning
- Needed a lot of attention and encouragement
- Very uninvolved
- Not a self starter
- Very disruptive
- Wouldn't follow directions

The Site Administrator in Columbus was hired by the School District. She was initially unsure of what to expect from the program. However, she was extremely supportive of SEEK by the end of the program. She shared that she even came to on of the culminating events to share how the students were indeed engaged and how wonderful she felt program was. She encouraged NSBE to continue this work.

One hundred and seventy five students were included in the Washington, D.C, mentor reflections of middle and elementary students. Of these, 142 were reported as actively engaged (81%); 4 were described as being engaged most of the time (2%); 13 sometimes (7%); and 16 as being not engaged (9%). The descriptions used by the mentors in describing the issues and assets students brought to the class are similar to those of the mentors in Columbus. Being easily distracted and then distracting others in the group was a common problem of those who were not engaged. In addition, in the elementary program one student was described as too young and thus had social problems with the other students.¹² The attendance issue was raised in the DC sample where students would frequently be absent. This, too, became a problem for the group as it took time to reorient or 'catch up' a student who had been absent.

Creativity, imagination, oratory skills, intelligence, being a good listener, being a good team worker, and positive energy were all listed as positive assets students brought to the classroom. Motivation and enthusiasm were key descriptors of many of the actively task engaged student who did represent most of the group. However, the mentors had a wide range of students who were described as actively engaged from those who were strong workers and listened to those students who could be described as disruptive as shown by the following sample of reflections on actively engaged students in DC:

¹² A few students in the elementary program had not yet completed the third grade. One was only seven years old. This posed problems as their pre/post-tests could not be used and in the case of this student, he was not fully accepted in the classroom due to his young age.

- Yes was actively engaged in tasks; showed creativity in the second day and new that plastic bags are one of the recycle materials and it results to win the distance and weight competition in skimmers; No social problem; Academic problem is math; is creative and motivation that results the group to win; Understood the concepts of the task at hand.
- Yes [this student] was actively engaged; most times a distraction to his team and the entire class; was usually arguing; is knowledgeable and could be a leader but immature; I would give him a listening ear.
- [Student] was actively engaged, everything we did she was always the first to raise her hand; exhibited a great amount of leadership and speaking up; no problems socially/academically; brought leadership, friendship, and kindness. She is a very nice child; did everything we asked her to plus more.
- Actively engaged - wanted to control group; tends to be others business; brought leadership qualities; would have changed limited social time
- Actively engaged; would willing help out and answer questions; works well with others; very artistic and creative; sometimes had small arguments no academic problems;
- Actively engaged; if asked would complete any task; works well with peers; confident in himself and his abilities; no social/academic problems; brought a positive attitude, ideas/in sight;
- Was actively engaged in tasks; he made his group fun; no problem socially, but maybe academically with written work; brought fun and a good atmosphere.
- Actively engaged; does most of the work in her group; talkative and manipulative with other students; has problems working in groups sometimes; brought intellect and creativity;

Typically students who were described as being engaged most of the time or sometimes mirrored the actively engaged students but varied in their involvement within the classroom. Some days they may have been more engaged than others. For example,

- Sometimes [this student was] actively engaged; not very focused on task; extremely intelligent but not always interested in academic projects; brought competitiveness to group; I would have made the groups smaller so that he would be required to do work and not rely on his teammates
- Wasn't always actively engaged; was disconnected some days; very smart;

- Had a hard time staying focused; worked mainly by himself due to absent group members so he paid attention to other groups; wondered around; lack of focus caused him to fall behind; when focused produces quality work; I switched his group which brought positive changes.

Students described as not engaging the week of the reflections were clearly in the minority. They frequently had academic or social issues; however, most did participate on some level. A sample of mentor reflections are shared below.

- Gets discouraged easily - abandons partners; tends to shut down at random points but can be goofy; doesn't work well with partner/resents correction and as a result will stop working; very intelligent and understood the assignment
- Wasn't actively engaged; he was the youngest and wasn't very interactive with the classmates; seemed to be the outcast; because of his age he didn't know as much as the 5th & 6th graders; didn't include him much activities and he was unwilling to participate because he felt like he was being picked on; I would have tried to put him w/his grade level and make more comfortable
- Not actively engaged; lack of interest; refused to talk when spoken to most of time; very creative - gave group ideas for glider; I would help make him understand the reason for camp.
- Not actively engaged; always messing with something while someone was talking; very talkative yes social; was in program last year so remembered a little bit.

Mentor reflections provide qualitative data on the students who attended the camps. NSBE cast a wide recruitment net and the resulting pool of students reflects this. Some students were academically strong others very weak. Some students were confident and others needed a lot of confidence building. Some students were great team players and other very resistant to team work. Some students were well behaved and others extremely disruptive. The majority of students based on these data, however, did participate, were engaged in the process and more about STEM areas, particularly engineering.

Columbus – Teacher and Parent Feedback

Two very important stakeholders in the middle school pilot program in Columbus are the Columbus Public School teachers, hired by the school district to participate in the SEEK program, and the parents of participating students. There were nine Columbus teachers involved with the program. Six went through most of the four day training with the mentors and the additional three were added late in the program or did not attend the full training sessions. There was confusion about the role of the Columbus teachers. After the initial training, the teachers who had gone through the SAE training were assigned to be mentors in specific classrooms. A listing of mentors per classroom was left on site after the training. The remaining teachers were to help across all classrooms

and in administrative, discipline issues. However, this was not communicated effectively to teachers, site administrators or mentors. Thus, none of the Columbus teachers served as mentors. All of them helped in a general support role. On the other hand, the three teachers who were part of the NSBE mentors group each had their assigned group of students and served as in classroom mentors. This confusion and lack of communication was reflected in the response of a couple of the Columbus teachers when they wrote:

- As a teacher, I was not sure of my place at the camp and made my own role. I hope in the future there will be role for the local teachers, they were not utilized. The mentors need to spend some time before the students arrive with a teacher and gain ideas for the three weeks.
- It was unclear exactly what everyone's role was and who was in charge of what. It was not clear who to go to for answers.

At the end of the program, the teachers were asked to email their reflections, comments and/or recommendations. Each of the five Columbus teachers who responded shared that they thought the program was a successful pilot.

- I sincerely believe the 1st S.E.E.K. camp was a success in Columbus, Ohio. My fellow teachers and I felt it was success, but we would like to make some recommendations for next year.
- I feel the SEEK program is a good example of multiple institutions and organizations working together to provide solid educational experiences for children. I thoroughly enjoyed working with the program and would love to participate in years to come.
- Overall the program was a pilot and I am looking for improvements for next year. I think it was a huge success and the students gained knowledge and bonded with the mentors. I am currently working at another camp, some of the same students are at this camp and they are still talking about SEEK and ready to sign up next year.
- I think the camp offered a wonderful opportunity for everyone involved. I love that it gave the students something safe and educational to do over the summer. Providing transportation and meals was a blessing for the students. I think it is great that the students were exposed to mentors from all different parts of the US. It was great for the students to see what they could become. I saw a lot of mentors that did an excellent job. I enjoyed learning different teaching styles and ideas. The field trip was a great idea. The kids really enjoyed the change.
- There were so many wonderful things that took place. A boy said, "my teacher tried to explain it to me during the school year and I never got it. But when you guys taught it, I got it." He was so happy for being able to solve the equation. I thank you for the opportunity to tell you a little bit about the experience.

Teachers also provided input on their perception of issues and problems. The biggest complaints of the Columbus teachers focused on the mentors, their training and role in the classroom. Professionalism, insufficient training, classroom decorum and classroom management were brought up as issues of concern. The following statements written by the teachers indicate their problems with some of the mentors:

- The mentors needed more structure as there was a wide range in how active they were, some did more of the share of work than others
- For the most part, most of the mentors began their role with enthusiasm. The 2nd week and 3rd week it was noticeable they became less involved with the children and would not allow any input or accept any help in instructing their class and classroom management techniques. Many times, 3 of the mentors sat together and were not involved while the 4th mentor tried to instruct the rest of the class that were not task. The 1st week, most of the mentors were engaged with the students, but as 2nd and 3rd weeks went by, they were less engaged and openly resisted any suggestions and help from the teachers.....not all of the mentors reacted this way. For example Mentor Herbert and his team were on task at all times.
- Many of the mentors left their role as a mentor/coach and became a buddy/friend to the students. Some of this was evident during the day of the contest. I know it was a day for excitement and fun but many of students were out of control and the mentors provided little support...I do not want to give you the impression that the mentors were bad, but many of them however sidetrack from their role as a mentor/coach.
- I think a crucial part of the entire experience is the mentor training. I hope in the future more time is spent on the curriculum, or allow them to have curriculum before they arrive. Some mentors were unsure of their curriculum and needed more time to prepare. When the curriculum was taught in the training, we were given an assignment for the following day to present to the others and then told to act like middle school students. The training day was unpleasant; I did not learn the curriculum at all. I studied on my own. The training needs to be prepared in a way that is efficient and timely. The mentors are a crucial role and the students enjoyed working with them, but we need to discuss professionalism and expectations before the students arrive.
- I had some frustration with the level of professionalism among the mentors. I repeatedly saw mentors listening to ipods and text messaging while teaching was going on. I also saw mentors laying their heads down and sleeping or resting their eyes. This was a problem because the students noticed and asked why the mentors were allowed to do those things when they weren't.

Other issues raised by the Columbus teachers were inappropriate discipline by a mentor, lunch time transition chaos, lack of classroom management, lack of coordination and lack of having a person 'in charge' of specific activities and personnel issues. In spite of these issues, the teachers felt the program was successful and offered to participate again in the future.

Three NSBE mentors at the Columbus site were credentialed teachers. They participated as mentors and had students assigned to them as did all of the mentors. Their perceptions were slightly different than the Columbus teachers as they wrote:

- I was rather fortunate to have had the opportunity to be a part of the program as a parent and as a teacher/mentor. I know from the perspective of my children that they were engaged on a daily basis learning something new. Most importantly they had the opportunity to have a tremendous amount of hands-on activities. For the Columbus students, they were given the opportunity to be exposed to a group of mentors who had their interest at heart. These students

had an opportunity to work on a project that kept their minds engaged over a three-week period. There is nothing that could beat them using their brains. [On] competition day students were all excited to show off their work and the best of all to compete.

- I enjoyed working together and interacting with the different mentors. I have met very positive fine young students who are going to make a positive change in the world someday.
- I had a great time in Columbus, Ohio, what an amazing program. The level professionalism was very high with the team, but we always had time for a few jokes. I want to continue working with NSBE and the wonderful mentorship programs offered throughout the year in the U.S. or Canada

One of the NSBE teachers did share that there were “too many varied dynamics among mentors. In some cases this really worked against the group as individuals felt they were there the year before and knew exactly what to do. Such individuals were inclined to “wing” their lessons and it showed.”

Parent Feedback

Following the 2008 SEEK pilot, on October 27th a focus group with parents was held to get their input.¹³ Parents are a very key stakeholder in the SEEK programs. Unlike DC, in Columbus parents did not pick up and drop off their children. Consequently, there was very little parent contact and communication on a day-to-day basis. At the competition, fourteen parents did come out with family members to observe and support their children. Each parent was approached and asked for if they would participate in a brief follow up phone interview regarding their child’s participation in SEEK. All fourteen agreed. Seven of the fourteen parents were available and able to participate in the phone interviews. The interview protocol included seven questions:

1. Please share how you learned about the SEEK program?
2. How do you think your child responded to the program?
3. What parts of the program do you think worked best? Did not work?
4. How would you assess the success of the SEEK program?
5. What recommendations would you suggest to improve the SEEK program?
6. Did your child share any stories about the program? Their participation?
7. Would you send your child to the SEEK program again if offered next year?

The parents interviewed had students going into the 7th and 8th grades. Four learned of the SEEK camp through fliers from AIM; one from her niece who worked at AIM; one from a gifted and talented teacher at Wedgwood Middle School; and, one from going to a meeting and getting the flier from Keisha and Christian. All seven parents, six mothers and one father, thought the program was a positive experience for their kids. Six of the seven shared they would definitely send their child back if the program was offered next summer. One parent shared that her daughter felt slighted at the competitions because she felt that she did a lot of work over the three weeks but didn’t get recognized for her work. She missed a violin camp to come to SEEK and expressed a desire to go to the violin camp next summer.

Parents also unanimously agreed that their child responded positively and gained from their SEEK experience as their comments show:

¹³ Carroll Consulting completed a summary of the focus group and submitted it to NSBE 11/6/07.

- ...the things that they [my children] talked about that they got out of SEEK was the motto. From it and in knowing that they don't have to just stop there and that they can tap into their own home schools; and the fact that they have a national organization that has adults that they can see where they can go...Every evening they would come home and say the motto because they had learned that. I don't remember the motto all together but I remember they talked about community; they talked about the individual and how they impact the community; and so they take that position obviously serious and they understand the impact it has on society as a whole. (Parent 1)
- I thought it was pretty good because the kids were in a school environment and they were constantly learning; so it keeps the brain fresh over the Summer time so that when they get ready to go back to school – they won't have that much of a transition because they've still been learning a little bit in school thru the program. [My son] said that he liked it. He didn't really complain about it too much. He was ready to go everyday; so you know usually if a kid is hesitant – don't want to go – this that and the other – they probably didn't like it; but I think he was having fun with all the kids. (Parent 2)
- She told me the actual activities that they did, the work that they did, was very good and kept her interested and she's one of those kids that gets bored easily. So, I thought that was good. She didn't come home complaining every day. She liked the teachers; she thought the teachers were very friendly and down to earth; and she liked the actual activities that they did. (Parent 3)
- She responded very well; she already likes science any way. She got to do different kinds of things. It helped them with team work. And so it just gave her a different aspect of it; like she got to see the project from the beginning all the way thru; she talked mostly about the teamwork...just working with a smaller team, like a group of her classmates... working on a project, building it up all together; trying to come up with the solutions; things they had to work on to get the project to run. (Parent 4)
- Oh, she loved it. Because she told me...the first day it was like – oh ok and she was like I don't know if I want to go and then the next day she was I am so glad I went...I really enjoyed it. (Parent 5)
- I think it was really good program because it gave the children – it taught them as well as you know it gave them something to do during the summer; plus it also taught them what they needed to learn to make things and to become better people; to work together as teams and to work also, with individuals; they learned quite a bit. (Parent 6)
- Yes, everyday they loved all of the mentors they worked with. I did not hear one complaint at all. So, I was very pleased because a lot of time with teachers and stuff you know you say, well I don't really like so and so....but there was not one complaint from them about their mentors. ..I think that they did an awesome job. (Parent 7)

Parents appreciated the small student to mentor ratio. They also thought that participating in the program built self-confidence and self-esteem in their children. One parent shared: "I think she gained some self confidence because she was really excited about going everyday and, about what she was doing and what the outcome was in the end, and meeting new friends and she was really excited at the awards ceremony when she got her lovely medals."

Parents discussed how seeing African American role models had a positive impact of their child's participation. They described how their children talked about the mentors and program at home in a very positive light.

- She was talking about them [the mentors] all the time...she loved them!"
- She just kept coming home every night, telling me about her different mentors. She had Mr. Wren and she had Ms. Martine and she loved them. They were really nice I got to meet them the day of the challenge. I just loved them too. They were just really nice people. Really encouraging I noticed.
- Mr. Twiceson – O'my gosh there were so many people; I heard his name, I think more than anything...and I really think that they were excited to be there with the kids. You know from when the kids would come up and talk to him and that was really important to me because they weren't going in there with the attitude of – "ok I got to go to work today." It was "Ok – I'm going today and it's going to be another fun day." So, I really appreciated that.

The program experience provided a different outlook on the future for their children. It also projected the message that you can be smart and have fun. Parents appreciated the medals ("they [her kids] loved the medals!"), praise and acknowledgement the program provided for their children.

When asked what they would improve or didn't like, a couple were at a loss of words and said they didn't have anything negative to say. However, a couple shared that students were not disciplined enough and that their lack of paying attention on competition day wasted some time that could have been devoted to the competitions. One shared that she felt that the mentors should have had a bit more control of students. At the competition, she mentioned that she couldn't tell which mentors were with her child's team as they were not sitting or standing with the team as she had anticipated. She shared, "...I would love to see the counselors. I had to look real hard because kids are so big today and try to determine who was the counselor...and I understand what it's like to have fun and be with them, but there was a part where they could have been a little more quieter; they have to do something that will really command their attention in terms of when they know it's quiet time and [time to pay] attention."

One parent was particularly happy to have received the bridge magazine. She read it thoroughly and was glad to learn of NSBE Jr. Chapters in the area. She shared, "I wasn't sure personally how engineering would fit into my child's life because he loves music and that is really what he's into; but when I read that NSBE magazine that he received, there is a woman in there that did sound engineering. Because [my son] can do different things for the church in terms of reproducing their tapes that they've done for like the choir and sermons, I figured that's a great way to bring both together for him. I appreciated having that book. I want to tell you because when I looked in the back that book, it listed all the chapters and almost every school here is already a member. But you don't have enough people feeding into it. Maybe they don't know, but I'm going to be one of the voices to make sure that people go and check it out."

All seven parents wanted the program in Columbus next year. All but one enthusiastically supported it for their child, and, when asked if their children would be back they shared,

- If they do it next year, I want to be one of the first ones to sign up.
- What have they done this summer they can truly say they went to a SEEK camp! Well what is that? Well they know how to explain it they know what the acronym

stands for and like I said they know the motto. So, I think they are great promoters for it and want to come back for more.

- I'm just looking forward to you guys expanding and if there is anymore information that you're program can send out about the NSBE group that would be wonderful too.
- Yes! I truly appreciate you all so much because it's been a long hard road for us these past few years. So to be able to go to the program was huge for us because I couldn't afford to send them to camp or anything. So, I truly appreciate all that you have done.
- Yes, because she got to see a project built. The other part that I do like is college students working with her – so she got to see, “ok if I get this far I could be giving back to the community.” For me and her that's a big plus for us.
- Yes...Have the program again. Even those that weren't serious at the end I think that if they had they would be more because at the end they realized, WOW – if I had put more effort into it I would have gotten even more out of it.

Parents recommended more parent involvement next year. A couple of them volunteered to help next year and one said she would help recruit other parents. One parent made the point when she shared “Well I think the only thing [recommendation for improvement] would be more parent involvement. If that's at all possible because a lot of parents work and I don't know if that would be beneficial to you all to have – you know because as a parent, I've volunteered many of hours to school functions; you know so kind of open it up if you're able to come out and help – I think that from my excitement and the kids' excitement, you know having a parent be involved would just probably heighten that excitement.”

One parent who had recently moved to Columbus with two sons, talked about sharing the program with others. When asked what she would tell another parent about the program, she answered as follows: “I would say first of all of how exciting it was to have my children come home everyday and tell me something new and tell me something that they did that was exciting; I would share how many new people they met and I would also tell you how to take advantage –it's a free program and I guess I feel like there is no reason – I don't see a reason why I would let my kids go. Even if I had to pay for it, I would still have them go to the program because it was just that exciting; and to be able to network, that's huge for me. Even at the kids age I think the earlier they start networking with people the better it is; and to be a member or affiliated, especially to have the black engineers there and you know that's exciting for me because I've always felt like my children – you know they kind of have 3 strikes against them – they come from a single parent home; they're black; and they're male. So, to be able to see positiveness and black males, that's really important for me as a parent; so not just a single parent, but just as a parent period. So, there was just so many things that they did and I think it opens up so many opportunities when they are able to go to something like that...I'm pushing for brain surgeons...But even with him. it's really changed his interest a lot also. So, I said, anytime you can impact him you've done your job... because he was like I think I can be a doctor and do something in engineering. I was like, you do? He was like, yeah I think I could do that. So, yeah he's real – he's one those people that once he says, he's doing this one thing, that's what he's doing and there's no ifs, ands or buts about it. To impact him and make him say, hey I want to reach for something else...that was huge for us.

Mentor End of Program Assessment

Mentors were asked to email an end of program overall assessment the week following the program. Due to problems which made it difficult for students to access the forms from their computers, far fewer responses were received than anticipated, eleven from Columbus and fourteen from Washington, DC. However, based on informal interviews with mentors before, during and on the last day of the programs, the data from the twenty five mentors appear representative of the mentors overall. Table 36 displays responses from the forced choice (agree/disagree) program overview items.

The end of program assessment of the training has the benefit of getting feedback after the mentors have experienced the program. The data are consistent with their pre-program training assessments. Columbus mentors felt the training about students and the projects was effective. The DC mentors were less positive about the training focusing on students. However, all mentors did feel they learned something new in training. More important, all of the mentors felt they developed a mentor relationship with the students.

Regarding their perceptions about the students the Columbus and the DC mentors agreed that their students were actively engaged. They also agreed that students gained valuable experiences, had fun and were exposed to engineering through their participation in SEEK. All but one of the respondents felt that students also improved their math skills (See Table 36). However, a couple shared their concerns about how a few of the students didn't want to be at the camp and thus caused distractions in the classroom and program. One mentor shared how some parents told their kids that this SEEK camp was a basketball camp and thus, when they came they were very disappointed to learn that it wasn't. Mentor reflections indicate that some kids definitely were forced by parents to come to the camp and did not want to be there. Overall, mentors did believe that the SEEK program met its goals for the majority of the students because a majority did want to be in the camp. These students got a lot out of their participation and facilitated the mentors reaching the goals and objectives of the camp as their responses indicate:

- Yes, the program met the goals and objectives. The fact that we had 300 students interested in pursuing some type of post secondary education is the best you can ask for! (C)
- I think the students for the most part increased their interest in engineering just by being there and completing the camp. (C)
- I think students were able to learn and explore concepts that are never presented to them in school (C)
- Students gained confidence. Some came into the camp never answering questions and shying away from group work and by the end, they were leaders in their respective groups. Knowledge is definitely power. (C)
- The program ensured that many of the kids would like to be an engineer in the future which is quite outstanding considering about half have really never seen an Engineer before. (C)
- I believe you have to have a good group of serious college students willing to put in the work. But as far as keeping the students engaged and peeking their interest in engineering, I think we did that.
- The SEEK program did meet its goals. You can lead a horse to water but you can't make him drink is the age old saying. We led these children to water. In every aspect we have fulfilled and exposed the children to take it in their own

hands and increase the number of culturally responsible black engineers, for them to strive to excel academically and through education, succeed professionally. Our impact in the lives of these kids has given them what they need to do these things.(DC)

- The kids just seemed eager to test their planes and were actively involved in critical thinking as to why their planes did fly....intro to engineering I call it!
- It [SEEK] is supposed to excite kids about engineering, math and science and it did. (DC)
- I believe the students became more interested and gained more knowledge about math and science. (DC)
- I think that the students learned that engineering is a very good field to go into and that you can learn and have fun at the same time. (DC)
- The kids gained new knowledge about engineering and how to solve problems. They got a new perspective of life and that gives them more options for when they grow up. (DC)
- Students were positively exposed to engineering concepts. By making prototypes, their interest was sparked. (DC)
- The students developed math and problem solving skills as well as presentation skills. They also built a relationship with me and I believe that improved the social confidence of my students. (DC)
- It met the goals because the SAE curriculum had everything that NSBE wanted the kids to learn: math, science, engineering.
- They [the students] gained valuable experiences and developed strong relationships with the mentors...and the program provided all the things that the students needed to meet their requirements. (DC)

Table 36 – Mentor End of Program Assessment (Columbus N=11; DC N=14)

We would like your feedback on the SEEK program. Your opinion really counts, so please let us know whether you agree or disagree with the following statements	Strongly Agree %		Agree %		Disagree %		Strongly Disagree %	
	C	DC	C	DC	C	DC	C	DC
1. The pre training about students was effective	9.1	0	81.8	71.4	0	28.6	9.1	0
2. The project based training was effective	18.2	14.3	63.6	78.6	18.2	7.1	0	0
3. I learned valuable new information in training.	18.2	28.6	63.6	71.4	18.2	0	0	0
4. The daily program schedule was effective.	0	7.1	72.7	57.1	27.3	35.7	0	0
5. My students were actively engaged.	100	7.1	0	92.9	0	0	0	0
6. My students gained valuable experiences.	36.4	42.9	63.6	57.1	0	0	0	0
7. The project material engaged the students.	9.1	35.7	81.8	50.0	9.1	14.3	0	0
8. I developed a mentor relationship with students.	54.5	71.4	45.5	28.6	0	0	0	0
9. Students were exposed to engineering.	54.5	64.3	45.5	35.7	0	0	0	0
10. Students had fun.	45.5	57.1	54.5	35.7	0	7.1	0	0
11. The pace of the program was positive.	18.2	15.4	36.4	69.2	45.5	15.4	0	0
12. Field trips enhanced the program.	45.5	14.3	45.5	0	0	71.4	9.1	14.3
13. The program was well organized.	0	7.1	60.0	57.1	30.0	35.7	10.0	0
14. Students improved their math skills.	10	14.3	60	85.7	20	0	10	0
15. I had someone to talk to about program problems.	40	21.4	50	78.6	10	0	0	0

The areas where mentors had the most negative responses were the operational variables and organization. Some felt the scheduling was not effective. The responses came from the middle school mentors at both sites. The Columbus mentors felt that the pace was a problem. The DC mentors felt that the field trips did not enhance the program. DC site administrators included end of week trial competitions to change the pace and to keep them engaged. Lunches at the both sites were reported to be very bad; and, the tardiness of meals in Columbus was frequently cited as a major problem. Mentors felt they did have someone to talk with regarding program problems. Over a third of respondents from all sites felt there needs to be better organization in the program. These responses came predominately from the middle school programs and are reflected in the following statement made by mentors:

- The program has to be well thought out and more organized. Everything needs to be set in stone and EVERYONE should follow. (DC)
- There could have been a bit more time management when it came to competition day (DC)
- The program had limited time to improve on the actual things which were supposed to be done and this caused shallow presentations. (DC)
- Things were not prepared and as timely as they should have been (DC)
- The camp was poorly managed. Next time please remember that SEEK is in its infancy and there are so many unknown factors that there is no need to complicate matters more than necessary...it is impossible to have four chiefs and to expect synergy – a year experience in Washington (2007) is no reason to feel empowered to call the shots and to “wing” lessons. (C)
- There seemed like there was a huge difference between the difficulty of the glider and the car. The other class my kids went to was able to build on day 1 and then had plenty of free time to play games and have fun. The kids often got bored with all the math and lessons that we had to go through before we could even get to build the toy cars.
- [Regarding organization] I think there was too much material in a short amount of time (especially for the motorized toy car) for all students to be able to completely understand everything. In that way, I think some of the students missed out (C)

Mentors shared they would love to come back again as they enjoyed working with and getting to know their mentees. Many exchanged contact information with each other and with their mentors in order to keep in touch. Some felt that the unevenness of commitment was a problem as some mentors worked more diligently than others, and some teachers were more helpful in Columbus than others. There was no one with the responsibility to insure consistent work across the board. Mentors in Columbus questioned why so many Columbus teachers were just ‘floating’ and not participating one-on-one with a group of students. One mentor suggested that one or two lead teachers do the instruction and the other mentors be instructed to help implement with their target students because when mentors were not all on the same page in a classroom it caused confusion. Thus, there was not a clear demarcation of roles both in and outside the classroom in respect to teachers and mentors. Mentors had many recommendations based on their experiences:

- I truly feel that trying to create two toys in three weeks should be revisited. Having two activities in one day was not the most practical way to go. An idea to be considered is to run the camp in one-week increments and hence build

- one toy per week. Not only will this give students an opportunity to choose what is closest to their interest, however, it will address the absentee issue. This suggestion came about due to the fact that there were at least 5 out of 17 students absent for between 3 and 5 days due to other activities/outings that their parents deemed necessary. (C)
- The 10 teachers hired from Columbus with the exception of Chad never taught in the classroom. They were great at serving means and technical support. The manner in which the program was set up encouraged these teachers to walk around and at times even 'try' to speak to mentors in a rather condescending manner...this was the biggest disaster ever. (C)
 - The field trip to Cosi needed to be more organized; two or three groups should stick together always throughout the whole trip. Prepare mentors with background information of each exhibit to teach something to the kids; do not just let kids run all over the place. Lots of students have been to Cosi so it is nothing new, but creating a fill in the blank or scavenger hunt for the student mark is great. Sort of like the amazing race where each clue is in a particular area of Cosi, and the next clue could not be provided until they figure out the code. (C)
 - Improve communication between the staff and the mentors; standardize the classes so some kids aren't getting overwhelmed with work in one class and nothing in the other. (C)
 - I did not like how the last week was supposed to be. We mentors were confused. The thing with the poster, we got that in an email. I mean I know what that was about, but come on, don't do that again. Overall just better planning. (C)
 - More training in how to present and use the project activity (including G2)
 - Let there be more fun activities for the kids because they all complained that they were not in school but in a summer camp. (C)
 - Plan out projects to be done for at least 3 summers. To have most of the same students come back who want to get the same mentors who were a part of the program would really be effective. If I had my students for two more summers then we can be sure to increase the number of culturally responsible black engineers who excel academically, succeed professionally, and positively impact the community. (C)
 - It would have been appreciated if mentors were provided some means of transportation on the weekends to see the Columbus area. It is known that 90% of the mentors were not from Columbus, and spent the majority of free time stuck on campus.
 - More and better communication between sponsors, mentors, coordinators and just everyone involved. Need to know who is doing what and why. (C)
 - Shorter classes. (DC)
 - More classroom activities. (DC)
 - Take into consideration the preferences of the mentors more. If we are not happy, then the children we teach may suffer because of it. In particular, on the mentor application next year, there should be an option of which age group you want to work with. (DC)

- Make the materials, documents, agendas, etc. available ahead of time. Implement a mentor screening process and a mentor (live) feedback session. (DC)
- Direct deposits of stipends. (DC)
- Social activities for mentors during off hours would be beneficial. (DC)
- More planning! Also, the curriculum; the majority of the time bored the kids. It was too simplistic. (DC)
- More time for training. (DC)
- Better facilities. (DC)
- Smaller groups during the competitions so they can run more smoothly. (DC)

Section 3 – Summary and Recommendations

SEEK camps were successful in all three locations in exposing students to engineering and what engineers do. The students who attended the sites varied tremendously in academic skills. Based on our findings, over a third of our students are not at grade level in math. The intervention was successful in teaching students new vocabulary based on the engineering challenges or ‘toys’ they worked on in the program. The program was also successful in helping students successfully improve their knowledge of the specific science and math standards practiced in the program intervention. More of the younger students were successful in answering grade level standard based problems. Younger students also showed greater gains on program intervention problems based on pre and post-test scores.

In the Columbus pilot middle school program students, parents, teachers and mentors felt the program was successful in meeting the three major goals of the SEEK program: 1)exposing youth to STEM activities and fields; 2) providing daily hands-on activities to engage students in engineering design and, 3) helping fulfilling the mission of NSBE. Mentors also indicated that this was true for the two Washington, DC sites. Elementary students performed better on their grade level standards than did middle school students. However, it appears that the get worse each year as the 3rd graders were more successful on the math standards than the 4th graders and the 4th graders performed better than the 5th graders.

Based on the data presented in this report, feedback from program coordinators and observations, the following recommendations are made for future SEEK camps.

1. Improve mentor and teachers selection process; develop criteria for participation; use mentor preference (included in the applications) in matching mentors with students);
2. Clarify role of teachers, lead mentors, and mentors in program so each group knows and understand roles of respective others; train on appropriate roles and do team building exercises with all;
3. Provide materials prior to training; where possible, include rules of behavior such as no talking on cell phones or texting during work hours;
4. Reduce MEES and Affirmative Development training and increase training for skills needed specifically for the mentors to successfully work in the classroom with students (i.e. more classroom management; team building; counseling and classroom time management skills);

5. Insure that equipment works; facilities meet need of program
6. Decide if special needs students should be included in program. If so, make sure staff understands the issues surrounding student(s) with these special needs.
7. Keep student to mentor ratio 5 or 6 to one;
8. Insure there is an administrator on site daily who understands and can answer questions/solve issues regarding all components and all stakeholders in program; more staff needed to insure quality control;
9. Make sure vendors understand the need for being on time (i.e. meals delivered for students late in Columbus caused many problems) and needs of their clients;
10. Create training template/modules that can be replicated simultaneously with different personnel at each SEEK camp; included a 'track' for returning mentors which is different from new mentor training;
11. Provide additional support materials for mentors to use with their students who are high achievers;
12. Need more curriculum for all grade levels so that students who come more than one year don't get repeat curriculum activities;¹⁴
13. G2 addition was very positive on the games side. Grades side was weaker and more attention/training/direction on how to move from games to grades recommended;
14. Improve communication among all stakeholders;
15. Better organize end of program/competitions. Parents and mentors in Columbus felt that the dismissing of students after competitions was not a sufficient program closure;
16. Create third challenge for middle school and replicate schedule of elementary program. One challenge each week and rotate instead of transitioning from one challenge to another each day;
17. Create incentive for parents to insure that their children fully attend;
18. Train and involve volunteer parents where possible;
19. Create curriculum for field trips so that students have tasks; clarify role of mentor on field trips;
20. Follow up with exit call to parents of students who drop out of program;
21. Initiate additional NSBE medals/awards for students who attend each day; for students who are actively engaged and do their work each day.
22. Create follow up programs/activities in NSBE Jr. chapters or participating schools so that this is not just a one shot summer program but one with continuing involvement with students;
23. Continue pre and post testing. Refine tests and use of scantron forms as answer sheets for tests to more efficiently and accurately grade tests;
24. Survey monkey (or similar programs) forms for mentors and teachers;
25. Create a SEEK data base to follow up with students and mentors.

¹⁴ Curriculum should be consistent with the current SEEK model: hands-on; train in short period of time; STEM focused; lends itself to end of week competition; active task engagement required; packaged for four days of instruction and one day of presentation/competition; authentic; grade appropriate; and, assessment built in.