

Wise Guys and Gals
Boys & Girls as *WISEngineering* STEM Learners
2015-2016 Interim Annual Report
June 2016

Introduction

WISE Guys and Gals – Boys & Girls as *WISEngineering* STEM Learners (WGG) is a 5 year Advancing Informal Science Learning project funded by the National Science Foundation. WGG has three major project objectives: (1) Develop blended (both virtual and hands-on) WGG engineering design challenges and enhance of the computer host platform called *WISEngineering* (2) Pilot and then revise the WGG design challenges based upon what is learned, and (3) Evaluate projects, materials, and overarching model.

WGG introduces informal, blended STEM engineering design challenge activities to middle school aged youth who attend Boys & Girls Clubs (B&GCs). As B&GC youth work their design challenges they will practice engineering design thinking and learn about engineering careers. These youth, who are typically underrepresented in STEM areas, also enhance their STEM knowledge through WGG activity participation. The WGG project is developing both brief (75 minute) and longer (up to three hour) informal engineering challenge activities that will require youth to engage in both computer-based work and hands-on design experiences. Once developed, piloted and revised these activities can be implemented at any B&GC or other informal STEM setting.

WGG Evaluation 2015-2016

The WGG evaluation is documenting and assessing WGG activities and whether they are being carried out as proposed and within the anticipated timeframe. During 2015-2016 WGG focused on pilot use and continued refinement of the WGG informed design engineering activities, development of written and virtual materials for training Facilitators, and to assess the feasibility of implementing WGG at B&GCs. During 2015-2016 the evaluation team:

- Attended all major project meetings
- Reviewed WGG activities for content and appropriate for clubs
- Developed data plan, including data to be collected from *WISEngineering*, feedback from stakeholders
- Observed implementation of WGG at clubs
- Collected monthly feedback from Facilitators
- Collected feedback from liaisons
- Attended AISL Project Director meeting

This report describes WGG progress in divided into four topics: WGG management and organizational structure; Refinement and enhancement of the *WISEngineering* platform; Revision of WGG activities and professional development materials; and preliminary findings from pilot testing of WGG activities at B&GCs.

WGG’s Management and Organizational Structure

During the first year, WGG leadership established committees or teams, include a development team (i.e., curriculum writers,) liaison consultant team (i.e., individuals who support implementation by working directly with staff at each B&GC), B&GC Facilitator team (i.e., B&GC staff who oversee the project and/or work directly with the youth to implement the activities), *WISEngineering* programmer team (i.e., computer scientists who focus on technology of *WISEngineering*, and evaluator team. To date this team model approach has been highly effective. One strength of the WGG team approach is the flexibility to revise the structure as the project matures. For example, in year 3 the need for the development team will be reduced since all WGG activities have been written. Project leadership in collaboration with the evaluator, is reviewing the roles and responsibilities of the development team for 2016-2017 to best address project needs as WGG moves from the development phase to implementation and testing phase.

In the last evaluation report the role of the liaison consultants who were assigned to one or more B&GCs was highlighted¹. During 2015-2016 the Liaisons were also expected to provide more detailed feedback about what was happening at the clubs. This role was very effective at helping the project identify and address challenges early, such as when clubs deviated from the prescribed implementation plans or failed to recruit the appropriate number of youth. An important reason for the WGG management success that was implemented in the first year and continued during the second year, was the use of frequent “check-ins” for team members using a variety of venues a) Basecamp² b) monthly liaison meetings and c) two meetings with representatives from all teams. In summary, WGG has continued to maintain a strong management structure that effectively facilitates communication among a wide range of partners and stakeholders

Refinement and Enhancement of the *WISEngineering* Platform

*WISEngineering*³ was further revised and refined during 2015-2016. Significant improvements have been made to the *WISEngineering* architecture, allowing greater access speed and easier use by youth. As glitches or needs were identified the programmer was quickly able to address the challenges. As a result problems encountered at one B&GC might be fixed by the time a second

¹ Project Liaisons are responsible for training the club Facilitators to implement the WGG activities. Liaisons helped to trouble shoot any problems that arose and provided essential feedback to the curriculum writers, PI and evaluators about implementation challenges and successes. The PI works as a project liaison to one B&GC, and this appears to have led to high buy-in and engagement by writers, liaisons and B&GC staff because the PI “got-it.” Challenges have been easily identified and addressed because the PI is actively rather than peripherally involved in delivery of project activities. Based on feedback from WGG participants the liaison model of WGG is a very successful way to bridge development, implementation and evaluation efforts.

² Basecamp is a web-based project management tool used for all project communications and activity development. Among the features available in Basecamp are to-do lists, file sharing, messaging and a text-based document sharing. WGG uses Basecamp as a place to upload project materials for review and discussion. All WGG team members were given access to Basecamp and encouraged to submit comments, concerns, and updates via the online tool. Further, Basecamp provides an archive of work that facilitates tracking development efforts over time.

³ *WISEngineering* is built off of the Web-based Inquiry Science Environment (WISE), developed at Berkeley University. WISE is an open-source computer-based learning management system that allows educators to author inquiry based science projects. It was also designed as a research tool for gathering of student data in schools. WGG worked with the Hofstca Computer Science department to enhance the *WISEngineering* platform.

club implemented the activity. All of the WGG design activities have been installed and run within *WISEngineering*. The *WISEngineering* platform is now fully available for both tablet and computer delivery. The one exception is Dance Party! which requires the use of Scratch and can only be accessed on a computer).

The functionality of the automatic grading feature for use with narratives was further developed during the past year. The WGG teams are currently discussing how and for which data the automatic grading will be most useful. Use of the automatic grading tool requires “training” of the system with multiple examples of responses for every level of scoring. Therefore any responses that will be scored must have varied responses. The evaluation team is reviewing data collected during 2015-2016 to decide upon the data that will be automatically scored and the system will be trained during summer 2016.

Finally, another noteworthy accomplishment was the creation of numerous *WISEngineering* report templates. The programmer worked closely with Project management, Liaisons and the Evaluators to create reporting systems that would serve multiple purposes. The Evaluators need data that can be used to assess youth change and can be downloaded into a database for analysis. Liaisons and Project Management need information to track B&GC participation, youth participation and overall progress meeting project requirements. Finally, a reporting system needs to be available to B&GC staff who are interested in reviewing youth progress and participation.

The programmer worked closely with the various WGG teams to assure revisions were useful and relevant. Continuously the enhancements of *WISEngineering* have exceeded the expectations of Project Management. Changes were often anticipated before they were fully identified as needs. In summary, *WISEngineering* enhancements and delivery to the clubs has worked almost seamlessly.

Revision of WGG Activities and Professional Development Materials

As noted in the previous evaluation report, WGG activities were written by a team of three experienced informal STEM curriculum developers, two of whom have extensive expertise using and programming WISE, the platform upon which *WISEngineering* is based. Each curriculum writer served as a lead author on three or four activities. Table 1 lists the activities and whether they were considered a short (i.e., to be completed in an afternoon) or extended (summer) activity.

During 2015-2016 each activity was revised after being reviewed by members of the various WGG teams and based upon what was learned during the first year. Among the key areas of revision were reducing the amount of required reading, including clear connections between the activity and a related engineering career, simplifying some of the language, and including more pictures. The alignment between the Facilitator guide and activities was reviewed to assure they were similar. Additionally, based upon what was learned in year 1, some activities were shortened to better fit within the traditional club timeframe. During year 2 the activities were tested (as described in the pilot section below) and further revised based upon both formal and informal feedback. Another, related revision to WGG involved “branding” of all materials. More specifically, the teams worked to use consistent formatting, colors, and wording to help create a

“WISEngineering” brand that would be immediately recognizable. This process was highly effective and demonstrates best practice in materials development.

Table 1. WGG Activities developed or under development

Activity	Short or Extended
High Five	Short (Teaser Activity)
Optimum Potato Chip	Short
Prosthetic Challenge	Short
Design for Sound	Short
Need Some Support	Short
Hover Above It All	Short
Slime	Short
A Mazing	Short
Kaleidoscopes	Short
Scratching	Short
Solar Cooker	Extended
Alka Seltzer Rocket	Extended
Shoe Design	Extended
Squirt	Extended
Yuky water	Extended

As the materials were revised, the written Facilitator guides were also revised to assure they were aligned with the corresponding activity. In addition, work began to develop virtual training materials. In January 2016 the Principal Investigator, Evaluator and two WGG activity writers meet in Charlottesville to develop a framework for virtual professional development guides that were aligned with the written Facilitator Guides. In January eight videos were created, followed by a late March meeting in New York when the remaining videos were completed. Feedback obtained from all project partners and a sample of WGG Facilitators was incorporated into the revised videos. During summer 2016 the videos will be reviewed by informal STEM educators not connected with the project and further revisions may be made.

WGG at Boys & Girls Clubs: Pilot Testing

All 10 B&GCs will implement each of the WGG activities by Fall 2016. This pilot test, which is currently underway, provides an opportunity to try-out and revise the procedures that will be used during the field test in 2016-2017, including the training and support Facilitators need and the assessment tools that can be used to document WGG implementation. Although the data are still being synthesized they also provide some early lessons learned about WGG.

Participating Boys and Girl Clubs

In Year 2 the number of participating clubs was increased by adding one club in Charlottesville, Virginia and a second club in New Rochelle. The club in Virginia is located near one of the activity writers (Jennie Chui) which allowed her to visit and observe activity delivery. This club also allowed WGG to explore implementation outside of the NYC metropolitan area. Dr. Chui served as

the Liaison for the Virginia B&GC. Table 2 presents details about each club that is participating during 2015-2016.

Table 2. General information about Boys and Girls Clubs participating in WGG

Boys and Girls Club	Location	Total Registered Members any age (2015)	Total Registered Teen members 13 or older (2015)
Bellport	Bellport, NY	859	435
Central Virginia	Charlottesville, VA	2007	576
Grenville Baker	Locust Valley, NY	1240	371
Glen Cove	Glen Cove, NY	570	300
Hicksville	Hicksville, NY	182	83
Hempstead	Hempstead, NY	253	131
Mount Vernon	Mount Vernon, NY	645	244
New Rochelle (Mascaro Clubhouse & Remington Clubhouse)	New Rochelle, NY	994	199
Oyster Bay	Oyster Bay, NY	278	257
Variety	Long Island City, NY	885	106
Total		7913	2702

Data Collection Strategies

During Year 2 several data collection approaches were tried out to document and assess the experiences of youth, Facilitators, club Directors, and Liaisons as they implemented the WGG activities. Data sources included information collected from within the *WISEngineering* platform (referred to as Internal WGG data sources) and information collected by project evaluators from other, external sources (referred to as External WGG data sources). These external sources included surveys, interviews, and observations. Tables 3 & 4 summarize the data that were examined and how these data were used to inform the evaluation.

Table 3. Internal WGG data collection efforts in Year 2

Internal WGG Data Sources	From This We Can Determine
The number of times a particular youth logged into the WGG program	The number of youth participating in each activity by club
Pictures, videos and text uploaded by youth to the design journal/wall	The process and product from each activity*
The amount of time each youth spent on each page of an activity (recorded in seconds)	Average time spent on questions and which pages youth spent little to no time on.
Youth responses to questions within the WGG activity	Youth responses (correct/incorrect) or if open ended response (text)**

* Not all clubs uploaded images, videos, and youth text

**Responses are dependent on the ways that each club Facilitator introduced and worked through the activity (i.e. many discuss correct responses prior to youth entering them).

Table 4. External WGG data collection efforts in Year 2

External WGG Data Sources	From This we Can Determine
Observations by evaluators and liaisons along with youth/Facilitator informal interviews/focus groups (5 observations completed)	Indicators of youth engagement, Facilitator style and implementation strategies, club challenges and successes
Club Facilitator post activity survey: administered immediately following implementation (25 completed surveys submitted)	Feedback about challenges and successes, Facilitator perspective on youth engagement
Liaison post visit survey completed after a club visit (6 surveys returned)	Feedback about Liaison experiences at specific clubs and how they are engaged with the clubs
Liaison Year 1 reflection survey (3 Surveys completed)	Overview of the Liaison role during year 1
Phone interviews with clubs Facilitators (6 phone interviews with 5 clubs)	Best practices in clubs that led to successful implementation of activities.
B&GC Director’s 6- month report (7 reports submitted)	Characteristics of WGG youth participants per club

Initially the Facilitator survey questions were embedded within *WISEngineering* and Facilitators were asked to log-in and complete the survey immediately following implementation of an activity. However, Facilitators rarely completed the survey, typically reporting that they did not have time. Therefore the evaluation team instead emailed each Facilitator a link to an online survey the day they reported that they would be implementing an activity. While some Facilitators completed the online survey, frequently clubs changed the day of implementation without informing the WGG teams, resulting in surveys not arriving at the correct time. The evaluation team then began to send two survey links monthly and asked the Facilitators to complete the survey as soon as possible after completing the activity. Although this process was the most successful, the response rate was somewhat inconsistent across clubs and overall lower than hoped.

The number of Facilitator surveys that were completed varied greatly across clubs. As of the writing of this report 25 surveys were completed, ranging from none at one club to seven at another club. The totals, by club are displayed in Table 5. The Greenville Baker B&GC Facilitator responded the most often, representing approximately 28% all completed responses. Following this was Bellport and Hicksville with four surveys each and Glen Cove and Hempstead with one survey each.

Table 5. The number of post-activity surveys completed by club

Club	Response Percent	Response Count
Bellport	16.0 %	4
Glen Cove	4.0 %	1
Greenville Baker	28.0 %	7
Hempstead	4.0 %	1
Hicksville	16.0 %	4
Long Island City	12.0 %	3

Club	Response Percent	Response Count
Mount Vernon	8.0 %	2
New Rochelle	0.0 %	0
Oyster Bay	12.0 %	3

Although results from the Facilitator survey were used primarily by WGG to make decisions about revisions of procedures or activities, this section highlights some of what was learned. The results are somewhat difficult to interpret because they refer to different activities and are reported by different clubs. Table 6 shows the number of surveys completed by activity. As shown in this table, the largest number of surveys were completed after the Design for Sound activity (n=5). Following this, was the Optimum Potato chip and Prosthetic Challenge (both n=4). Only one project Facilitator reported completing Dance Party!

Table 6. Activity implemented prior to completion of Facilitator survey

WGG Activity	Response Percent	Response Count
Design for Sound	20.00%	5
Optimum Potato Chip	16.00%	4
Prosthetic Challenge	16.00%	4
Is all Slime Engineered Equally?	12.00%	3
Avatar	8.00%	2
High Five	8.00%	2
Need Some Support	8.00%	2
Design your Path!	8.00%	2
Dance Party!	4.00%	1
Filtering Yucky Water	0.00%	0
Magical Mirrors - Kaleidoscope Design	0.00%	0
Splash Down! Water Game Design	0.00%	0
Designing Rockets	0.00%	0
Solar Cooker	0.00%	0
WuGG to the Rescue	0.00%	0

In addition to data collected using the Facilitator surveys, the evaluation team also interviewed Facilitators from five clubs. The semi-structured interviews included questions about activity implementation, youth engagement, and overall implementation success and challenges. Additionally, the B&GC Director reports asked Facilitators to reflect on recruitment efforts, implementation protocols developed at the clubs, and recommendations for new Facilitators. This data is summarized below.

Facilitator Preparation and Implementation of WGG Activities

During 2015-2016 each participating B&GC was asked to implement one or two full activities each month, with at least 15 youth. Table 7 presents the months during which each activity was to be implemented. This order was introduced to help Facilitators, liaisons, and evaluators track implementation, and to simplify Hofstra's delivering of WGG activity supplies to clubs. The order of the WGG activities took into account what was learned during the prior year about the complexity of the design challenge and the amount of training needed by Facilitators. For example, the first activity, the "High Five" activity provides a simple introduction to the *WISEngineering* interface. The second two activities, Optimum Potato Chip, and Design for Sound are relatively easy for Facilitators and youth. In contrast, Filtering Yucky Water is a challenging activity that requires a great deal of preparation and training and was therefore introduced last.

Table 7. Calendar of implementation of WGG activities

Month	Activity
October 2015	Avatar, High Five
November 2015	Optimum Potato Chip, Design for Sound
December 2015	Prosthetic Challenge
January 2016	Need Some Support, Is all Slime Engineered Equally?
February 2016	Design your Path, Dance Party
March 2016	Hover Above it All, Magical Mirrors - Kaleidoscope Challenge
April 2016	Filtering Yucky Water,
Summer 2016	Solar Cooker, Splash Down! Water Game Design, Designing Rockets, WuGGs to the Rescue

Prior to implementing an activity the Liaisons visited the clubs, delivered all needed supplies and provided any needed training. As during the prior year, each Liaison was assigned two to three clubs and responsible for working with that club for the entire year. The Liaisons reported that the amount of training required varied across clubs and across activities. When B&GC staff changed the training needs increased. Since there was high turnover of Facilitators at several clubs the training of new Facilitators was a large part of the liaison job. For example at the Oyster Bay B&GC the Facilitator who had been working with the program since the beginning left at the end of December 2015. The club then did not fill the Facilitator position for three months. At Variety B&GC the WGG a new Facilitator began in mid-October 2015 who then left in mid-April 2016. They have since found a replacement for the position but the new Facilitator is still struggling to get the activities off the ground.

Finding time to provide training was also a challenge. Many Liaisons work part-time and have schedules that are not compatible with the Facilitators' schedules. Although Liaisons were encouraged to visit the clubs when the activities were in progress, this also was rarely possible given the Facilitators schedules and frequent last minute changes to the implementation schedule. Instead the Facilitators generally handled WGG activity delivery and then provided feedback to the Liaisons afterward. In 2016-2017 as the number of clubs increases WGG will transition from face to face training and to a virtual model.

Preliminary Findings from Pilot Study to Date

The pilot study is still underway and the data are still being collected. Throughout the pilot changes were often made to data collection procedures (e.g., trying different ways to get Facilitators to provide feedback following implementation) and to the WGG activities and *WISEngineering* interface, allowing the evaluators to study the changes and enhancements as soon as they were completed rather than strive for consistency across activities and clubs. As the data are reviewed and synthesized additional revisions will be made to the WGG activities and assessment tools. The WGG teams used the pilot study as an opportunity to identify likely promising (and unpromising) practices and procedures.

Recruitment of Youth

An important consideration of 2016-2017 is to assure the clubs engage at least 12-15 students in each activity. The 2015-2016 data reveals that some clubs struggled with youth recruitment. Facilitator interviews and B&GC Director reports revealed that several strategies were successful for recruitment of youth. Facilitators suggested that a successful recruitment effort for engaging youth was to have other youth share information through peer word of mouth. One Facilitator used a social gathering, “each middle school club member is allowed to invite a friend to this social gathering. During the event middle school club members will have the opportunity to socialize with other club members who may not be involved in WISE.” Other successful recruiting efforts included reaching out to parents, by phone or in person, advertising through flyers or online and by displaying WGG projects and signs throughout the club. Facilitators also described approaches that were unsuccessful. One club Facilitator mentioned that distributing flyer to science teachers was “unsuccessful.” Several WGG Facilitators recommended not holding WGG activities on days when sports and or other popular activities were occurring.

Facilitator Feedback about Recruitment Efforts for WGG Activities/Program (verbatim quotes)

- *One way we sought to recruit new students is by word of mouth. With our organization catering to about 15-30 kids per day, most of our members have friendships that extend outside our doors. Many members inquire about WGG because they have seen projects or heard about them from fellow members. We made efforts to not only praise existing participants, but to also display their work over the past year in the hopes to entice and intrigue potential participants. Displaying past projects and pictures in our Recreation Lounge will also serve as a mode to recruit new students. Staff also contributed by making daily/weekly announcements about WGG and what it entails. This was followed up with posts and reminders on our social media as well.*
- *I went to the program several times before it started to get to know the club members and mention the upcoming engineering club. I started with the club members who have done some of my previous projects at another site. The Unit Director mentioned the upcoming program during announcements when the students had to pick a club to join.*
- *We made calendars ahead of time to promote activities. Staff made an effort to promote interest in the project so youth would be engaged. Our Fridays are “Bring a Friend Fridays” so members would sometimes bring their friends during a STEM lesson. This was not always successful because of new accounts being made and new youth being*

unprepared for the structure involved with 6th grade STEM lessons. However, other times new youth were excited to make a tangible object they could take home.

- We gathered the members of our SACC (School Age Child Care) program who met the criteria for the Wise Guys & Gals STEM program. This has proven to be successful. We have also visited the middle school in the area. We have given flyers to the science teachers. This has proven to be an unsuccessful endeavor.*
- The S.T.E.M. program is offered exclusively to our 12 year old Middle School members. The group visits the Learning Center once per week where they are given an overview of the project followed by hands on participation. Members are divided into two groups, Group A and Group B. The smaller group size helped to keep more members engaged. On an alternating schedule, each group of 14 members participated in a S.T.E.M. project – the following week the other group would participate in the same S.T.E.M. project. The other group of 14 members were allotted free time to watch a movie or play board games/video games. This worked as an incentive/reward for participating in S.T.E.M. every other week. Fridays became a challenge, as Fridays are often the day of the week that the Club holds special events. Adjustments were made to accommodate the group for an hour in the Learning Center on Mondays and an hour in the Computer Lab on Thursdays.*
- Recruitment efforts always begin with advertising: putting the program in our bi-annual newsletter, on our website, creating flyers that are hung around the building, and word of mouth. After advertising, our staff engages in one-on-one conversations to recruit members that we believe will have interest in the program, particularly the members who frequent our Technology Center programs. This effort usually establishes the core base of our members, roughly ten to twelve kids depending on the week. From here we use those kids to recruit more, trying to attract the interest of their friends, as well as individually pursuing members who we know do not have any activities planned during WISEngineering.*
- We've also begun to tie WISEngineering into our other programs, particularly our SMART Girls and Girls Who Code programs. We've found that by integrating programs we can attract members who may not have been interested before, as well as demonstrating to our members that there are overlaps in their interests.*
- Peer recruitment: WISE learners ask their middle school friends to sign up to be a part of STEM. Some of them never heard of STEM and are interested in seeing what it is about.*
- Recruitment for WISEngineer's Summer Camp: Flyers are distributed to parents about the summer STEM Camp. A lot of the middle school kids do not attend a summer camp and need somewhere to go to have fun and be constructive. Both parents and kids are excited to attend.*
- School collaboration: The grant coordinator reached out to the 2 public middle school principals in our city but did not get any response from them. However, now we have built a closer relationship with the middle schools and are working together. The clubhouse director and I will be meeting with both principals and guidance counselors to explain to them what we will be offering this summer and next fall for the middle school students.*
- Parent notification: Parents are called about what programs we offer that require parental consent. They are always impressed to know that there is a STEM program*

being facilitated at the Boys and Girls Club. Parents were also invited to a parent staff night where they learned about the WISE Guys and Gals program amongst others.

- *Peer socialization/engagement event: This May our middle school population at both of our New Rochelle clubhouses will be hosting our first ever Middle School Ice Cream Social. Each middle school club member is allowed to invite a friend to this social gathering. During the event middle school club members will have the opportunity to socialize with other club members who may not be involved in WISE but may have an interest to do so. In addition, non-members will have the opportunity to learn about WISE and sign up to the program if they are interested. There will also be a slideshow of past pictures of some of our WISEngineer's in progress. Hopefully this will strike their interest and want to be a part of this growing group of WISE Guys and Gals.*
- *Social Media: The Boys and Girls Club of New Rochelle has become more active in social media. We are including pictures from our past summer and fall WISE program on our bgcnr.org website, Facebook and Twitter accounts. The WISEngineering summer camp will also be posted up on our social media.*

Youth Participants

During the pilot study it became evident that accurately counting the number of youth participants was more challenging than expected. Information about club participants was examined from two sources: a) the 6-month B&GC Director reports submitted to the regional B&GC director (also a project Co-PI) to document youth participation and b) the *WISEngineering* log-in reports.

WISEngineering creates a unique log-in code for each youth and the expectation is that youth will use that log-in every time he or she begins a session in *WISEngineering*. For purposes of consistency, the *WISEngineering* data were downloaded from between September 2015 and February 2016. Data collected from both sources are described below.

Table 8. Number of youth participants reported from B&GC Directors compared to *WISEngineering* (September 2015 through February 2016)

Boys and Girls Club	Number of youth as reported on B&GC Director Report (9/2015-2/2016)	Number of youth as reported in <i>WISEngineering</i> (9/2015 – 2/2016)
Bellport	19	31
Central VA	28	41
Glen Cove	25	58
Grenville Baker	15	24
Hempstead	27	32
Hicksville	17	28
Mt Vernon	*	18
New Rochelle	27	37
Oyster Bay	*	9
Variety	*	37

*B&GC Directors report not submitted

Table 9 displays the WGG activities completed at B&GCs between 9/1/2015 and 2/29/2016 as reported by the B&GC Directors. (Activities completed during March, April, and May are not reflected here). These numbers were reported by the clubs and reflect sign-in or locally maintained records. It should be noted that since these counts are the number of youth participant by activity if a youth participated in multiple activities he or she is included in both counts. Reports were not received from three clubs (i.e., Mount Vernon, Oyster Bay and Variety.)

Table 9. Number of Youth participants by club and activity reported by B&GC Directors (September 2015 through February 2016)

Date	B&GC	Activity	# Youth
Unknown	Bellport	Avatar	27
11/17/2015	Bellport	Optimum Potato Chip	7
12/4/2015	Bellport	Prosthetic Challenge	10
1/8/2016	Bellport	Slime	15
1/22/2016	Bellport	Structures (Support)	11
2/12/2016	Bellport	Design your Path	12
2/23/2016	Bellport	Dance (Scratch)	10
Central Virginia			
10/28/2015	Central Virginia	Avatar	15
10/28/2015	Central Virginia	High Five	15
11/4/2015	Central Virginia	Optimum Potato Chip	15
11/18/15 & 12/2/15	Central Virginia	Prosthetic Challenge	15
1/6/2016	Central Virginia	Speaker (Sound)	10
1/20/2016	Central Virginia	Slime	10
2/10/2016	Central Virginia	Structures (Support)	14
2/24/2016	Central Virginia	Design your Path	15
Glen Cove			
10/2/2015	Glen Cove	Avatar	25
11/3/2015	Glen Cove	High Five	14
11/3/2015	Glen Cove	Optimum Potato Chip	13
12/4/2015	Glen Cove	Design for Sound	17
2/1/2016	Glen Cove	Slime	7
Grenville Baker			
10/13/15	Grenville Baker	High Five	16
11/10/15	Grenville Baker	Optimum Potato Chip	16
12/1/15	Grenville Baker	Prosthetic Challenge	16
1/26/16	Grenville Baker	Is All Slime Engineered Equally?	14
2/29/16	Grenville Baker	Design Your Path	4
3/29/16	Grenville Baker	Hover Above it all	15
Hempstead			
11/06/2015	Hempstead	Optimum Potato Chip	17
11/13/2015	Hempstead	Design for Sound	15
12/04/2015	Hempstead	Prosthetic Challenge	16
01/15/2016	Hempstead	Need Some Support?	15

Date	B&GC	Activity	# Youth
01/29/2016	Hempstead	Slime Engineering	15
02/12/2016	Hempstead	Design Your Path	13
11/20/2015	Hicksville	Optimum Potato Chip	10
12/18/2015	Hicksville	Prosthetic Challenge	15
01/15/2016	Hicksville	Design For Sound	13
01/29/2016	Hicksville	Is All Slime Engineered Equally	10
03/25/2016	Hicksville	Design Your Own Path	12
Not submitted	Mount Vernon		
10/21/15	New Rochelle	Avatar/High Five	15
10/28/15	New Rochelle	Optimum Potato Chip	15
11/16/16	New Rochelle	Design for Sound	14
1/13/16	New Rochelle	Prosthetic Challenge	5
1/27/16	New Rochelle	Is All Slime Engineered Equally?	11
2/17/16	New Rochelle	Dance Party- Session 1	8
2/24/16	New Rochelle	Dance Party- Session 2	7
Not submitted	Oyster Bay		
Not submitted	Variety		

Additional information was requested from each B&GC Director about WGG youth participants broken down by race and gender. As is evident in Table 10, racially the majority of youth are traditionally underrepresented in STEM activities. Yet, the number of female participants is lower than males. It should be noted unlike the above table, the youth are only counted once in this table, regardless of how many activities they complete.

Table 10. Total Youth Served by Race and Gender as reported by B&GC Directors (n= 158 youth)

Race	Total Number	Percentage
African American	57	36
Hispanic	56	35
White	20	11
Asian	2	1
Multi-Racial	18	13
Other	5	3
Gender	Total Number	Percentage
Male	110	70
Female	48	30

Table 11 presents a count of the number of log-ins into *WISEngineering*. There were a total of 286 unique log-ins between September 1, 2015 and February 29, 2016. Most clubs successful engaged at least 10 youth in each activity. Interviews with Facilitators and Liaisons at clubs where the numbers were low revealed there were typically challenges at the clubs that prevented full participation. Staff turnover was the most common reason cited. Problems with technology and weather disruptions also sometimes lead to smaller numbers of participants. Furthermore log-in totals may not provide an accurate count of the number of youth since Facilitators sometimes created their own log-in codes which were similar to youth log-in codes. Additionally, Facilitators reported that they sometimes created multiple codes for the same youth because codes were forgotten.

Table 11. Number of youth logging into *WISEngineering* per activity 9/2015-2/2016

WGG Activity	Boys and Girls Club									
	Bellport	Central VA	Glen Cove	Grenville Baker	Hempstead	Hicksville	Mt Vernon	New Rochelle	Oyster Bay	Variety
Avatar	27	41	54	10	11	20	15	29	9	33
Optimum Potato Chip	6	15	14	19	18	13	14	13	6	19
Design for Sound	3	10	17	19	16	9	10	0	4	21
Prosthetic Challenge	13	15	0	17	18	8	14	7	3	11
Need Some Support?	15	13	0	15	13	0	0	0	0	0
Is All Slime Engineered Equally?	16	10	15	14	15	15	0	11	9	0
Design Your Path!	14	22	0	3	13	0	0	0	0	0
Dance Party!	3	0	1	17	1	1	0	6	0	2
Hover Above it All	2	0	7	0	0	0	0	0	0	0
Designing Rockets	0	0	11	0	0	0	0	0	0	0
Solar Cooker	1	0	11	1	1	1	0	0	0	0
Splash Down!	0	0	6	0	0	0	1	5	0	0

Delivery of WGG Activities

The evaluation team collected data from multiple sources about how Facilitators implemented the WGG activities (e.g., Facilitator survey, Liaison surveys/interviews, review of *WISEngineering* data, and observations at the clubs). The data revealed that B&GC Facilitators often adapted the procedures of WGG (which were presented in the WGG Facilitator guide and explained during meetings). Deviations ranged from allowing youth to work in groups to not having youth complete the computer/tablet components after completing the design activity⁴. Facilitators reported the changes were necessary to best serve the B&GC youth. The WGG Management, Liaison and Evaluator teams, with input from the Advisory Board members, is considering how to address these changes in 2016-2017 and reach the best balance between meeting the needs of the clubs and the needs of research and development.

For the most part, clubs were able to successfully complete an average of two activities per month, thereby adhering to the WGG schedule. The clubs that struggled to meet these requirements typically experienced staff changes that delayed implementation and required the training of a new Facilitator. Clubs varied in how they delivered WGG and how they had youth complete *WISEngineering*. For example, although instructed to have each youth log into *WISEngineering* individually, some Facilitators reported that they allowed youth to “share computers or tablets” using only a single log-in. Problems with connectivity of multiple tablets at the same time created obstacles to logging into *WISEngineering*⁵ and occasionally Facilitators would have youth complete design activity but not the virtual part.

The clubs used a variety of ways to implement WGG activities as well as move youth through an activity to completion. Facilitator interviews and B&GC Director reports revealed that strategies ranging from a regimented implementation to a more fluid and activity dependent implementation. However, most successful implementation strategies tend to involve the Facilitator becoming familiar with the activity and pre-planning. Facilitating student discussion of STEM content throughout the activity was also stressed. The Prosthetic Leg activity was identified as an activity that the youth particularly liked. Successful implementation strategies are reported below.

Implementation stories of WGG (verbatim quotes from Facilitators)

- *I start by welcoming the students to Engineering Club then I give them a basic outline of the activity. I go over background information then dive right into the details of the project. Have them choose their groups and let them complete the first couple of sections on the tablet then pass out materials for the hands-on component. After they finish, I let them do the follow-up questions and I ask them open-ended then they clean up.*
- *Before a WISE activity is started, a group discussion is lead going over the tasks and goals of the project. When in session, students take turns reading out loud as we progress*

⁴ WGG is designed to engage youth in virtual scaffolding completed individually to prepare them for the designing experience, followed by a hands-on design activity that can be completed individually or as a group, and ending with an individual reflection, including uploading of pictures, videos, or narratives once again on the computer/tablet.

⁵ Problems with connectivity have been addressed. Easy to complete tests of bandwidth were shared with the clubs, and when needed additional resources provided to enhance the bandwidth.

through each page. When the question sections are reached, students are encouraged to discuss with their groups and raise their hands if they have the answers. When constructing, students are given a time frame to when they should finish. Facilitators are on hand to help with questions or confusion. At the end of each activity, students share their feelings about the project and what was learned by participating.

- I begin with all members signing in and waiting for the access code as a group. Once everyone has that window open, I'll tell them to log in and wait on the first screen. I will quickly summarize what type of engineering they will be experiencing today and through what means. Then, as a group, we read through and answer questions. I will repeat what certain 'buzz words' for all the activities (Specifications, Constraints, etc). Materials are distributed and members begin with the hands on portion working at their own pace. I usually try to test as a group so we can all experience each other's projects, this allows for higher engagement. I wrap up activities as youth finish their work. I go to each group individually as they finish the final questions. Once completed, they log out and have earned playtime on the computers or recreational activity in the other rooms.
- I usually start off with a summary of the project, and then continue with a brief question & answer series. The kids then proceed with the online WISE website discussion and questionnaire. We then take a break for snack; afterwards we continue with the actual project and finish up online. The students are encouraged to work as a team and assist those who are struggling, in order to promote leadership and teamwork.
- Projects begin with a general discussion about the topic at hand. This helps gain interest in the overall topic and particular engineering field before diving into the specifics of the project, and gives us a sense of members' prior knowledge as it relates to the material. To encourage participation, members are called on to read directions aloud and brainstorm ideas prior to beginning the hands on component of the activities. To make tasks more manageable, projects are broken into smaller sections – instructions are read together then, individually or in our smaller groups, members work to complete the steps, with myself walking around the room to check for accuracy. With sporadic pickups and dismissal, having a formal wrap up discussion with the entire group is a challenge, but moving forward we will look into adding a weekly reflection component to discuss activities that took place in the previous week at the beginning of each program time.
- We do not have a general WISE activity routine but instead tailor each session to the project at hand. For some, we find that it is better to dive right into the hands-on project, almost challenging the kids to go at it blind so that we can see their ideas, watch them "fail," then show them the engineering principles that will solve the problems they are having. For others, we start with a more instructional activity similar to a teaching session, then disperse into the groups to do the project itself. Activities are always wrapped up by having the members, as a full group, show their work, explain their ideas, and demonstrate their findings. This could be as simple as everyone gathering to watch the books be placed on the structures in "Need Some Support?" or simulating hovercraft races at the end "Hover Above It All."
- 1. Activity set up by Facilitator/ introduction to WISEngineering activity: In the beginning of each WISE session our WISE Guys and Gals briefly explains what WISEngineering and STEM is to new learners. This allows the new learners to understand what they are getting involved in as well as helps to reiterate what the

program is about to current learners. Then I introduce what STEM activity they will be engineering for the day.

2. Discussion and example of specifications vs. constraints in each WISE activity:

Everyone in the group discusses and give an example of a specification and a constraint. It does not have to be an example in the current activity. The goal is for all of the learners to have a clear understanding of what each is. This helps them to maneuver themselves throughout each activity, especially the questions. When they don't have a basic understanding of that concept, a lot of them get lost or stuck. Eventually, they may lose their initial desire to learn the engineering process all together. While at times this can be inevitable, it also can be prevented when the learner has a greater idea/understanding of what it is they are doing. This is a very important part in the engineering learning process. It also applies to just about every experience in life. Often I have them compare and give examples of real life so that it would help to simplify the WISE activity they are doing.

3. Students work on activity in groups or alone: Depending on what the activity instructions ask for learners may be working independently or in groups. At this time, most learners are focused into what it is they are doing. If they are in a group, they are obligated to engage with their fellow WISE engineers. While few work exceptionally well by themselves, most of them prefer to work with a partner or in a group.

4. Group discussion/ conclusion of activity: After prototypes are built I have the group stop what they are doing to share and look around at what their fellow WISE engineers have built. This is the part when everyone has the time to interact with one another. They also discuss what they could have done differently with their finished product. Sometimes if they have enough time, they would make changes. They are also learning that an essential part of the engineering process is revision, innovation and improvising.

5. Clean up with learners/ dismissal: Everyone works together as a team to help clean up when it is time to be dismissed. Now they better understand one of their major constraints; time. Our WISE Guys and Girls are starting to use their time wisely during their engineering sessions.

Use of Tablets

Facilitators were asked if youth used the tables. Approximately half (12 of 22 responding Facilitators or 55%) responded yes and the remaining 10 responded no. The 10 Facilitators who reported not using the tablets were asked to explain why the tablets were not used. Out of the 10 responses, three Facilitators discussed not wanting to make mess and four mentioned that they found the desktops were easier to maneuver.

Reasons Facilitators Did Not Use Tablets (verbatim quotes)

- *We used our club computers.*
- *For using scratch it was easier to use the computers since the computers already had scratch installed.*
- *For this project, we had a site visit by our Facilitator ****. In the interest of saving time, laptops were used so that students could work in groups of 3, limiting the time to answer questions and increasing the collaboration between the students. In my experience with this particular group in attendance, the students tend to take much longer to answer the accompanying questions, while others will rush through them quickly.*

- *After the last activity, several students had issues loading the project on the tablet. The code would be entered, and then "successfully added" according to the tablet, but would not come up on the Home Screen. Some students were able to access the project by logging off and on again, others were not*
- *This activity for our members was much better suited on the desk tops.*
- *We used computers to create the avatars.*
- *The chips are greasy and we did not want to get any grease on them.*
- *Too messy.*
- *Since this was a "kitchen project" we did not want to risk getting them wet or messy.*
- *We do not have the appropriate Wi-Fi to use our tablets.*

Facilitators were also asked when working on the tablets/computers, did youth work in groups? Nineteen Facilitators responded to this question. The majority (13 or 68%) reported that youth worked in groups when working on tablets/computers. When asked how many youth worked together the following responses were given:

How Many Youth Worked in Groups on Tablets/Computers At WGG Clubs? (verbatim quotes from Facilitators)

- *15 in 5 groups*
- *14 in 7 groups*
- *15 members in 6 teams*
- *14*
- *15 logged into the WGG site for this project.*
- *9*
- *All youth were logged into the website on their accounts, as the laptop allows 3 youth to log on a group on one laptop.*
- *All youth were logged on to the website. (Two groups of 3, and one group of 2 on laptops)*
- *There were 5 teams that logged in. This was our first time logging in as a group.*
- *18*
- *3*
- *11*
- *16*

Additional data that can be generated by the *WISEngineering* data report platform includes page completion (i.e. time youth spent on the page) and question completion (percentage of questions attempted) by activity. Table 12 presents a sample of the question completion table for data generated between September 1, 2015-February 29, 2016 for the first seven activities. These data, along with youth level data will be analyzed during the summer 2016.

Table 12. Question completion rates by club from WISEngineering data reports between September 2015 and February 2016

Club	Optimum Potato Chip	Design for Sound	Prosthetic Challenge	Need Some Support?	Is All Slime Engineered Equally?	Design Your Path!	Dance Party!
Bellport	100.00%	66.67%	84.72%	74.73%	100.00%	74.29%	80.00%
Charlottesville VA	78.33%	90.74%	80.00%	83.52%	87.50%	89.09%	0.00%
Glen Cove	91.96%	66.67%	0.00%	0.00%	52.38%	0.00%	40.00%
Grenville Baker	95.59%	98.25%	96.08%	100.00%	97.62%	93.33%	100.00%
Hempstead	98.61%	97.92%	93.52%	100.00%	93.33%	60.00%	100.00%
Hicksville	99.04%	61.11%	93.75%	0.00%	95.83%	0.00%	60.00%
Mt Vernon	86.61%	70.00%	96.43%	0.00%	0.00%	0.00%	0.00%
New Rochelle	64.29%	0.00%	44.44%	0.00%	23.81%	0.00%	66.67%
Oyster Bay	80.00%	66.67%	61.11%	0.00%	0.00%	0.00%	0.00%
Variety	78.29%	80.00%	81.82%	0.00%	0.00%	0.00%	100.00%

Youth Engagement during WGG

Facilitators were asked to rate the level of youth engagement in nine areas using a five point Likert-type scale ranging from *none of the youth* (were engaged) to *all of the youth* (were engaged). Facilitators reported youth were most engaged in trying to complete the activity at hand, with 87% indicating all of the youth were engaged and 100% stating at least half the youth were engaged in trying to complete the activity. More than half of the Facilitators also reported that all of the youth connected to the activity in an emotional way, expressing positive or negative reactions about the activity (58%), and in evaluating their designs (52%). The table also indicates that half the Facilitators reported that many youth did not revise their design. Five Facilitators reported none of their youth were engaged in revising their design (21%). Four Facilitators reported that none of the youth planned how they would approach the design, although eight reported that all the youth engaged in planning activities. It is unknown if this is due to time constraints, limited encouragement, a lack of awareness they can revise, or specific to particular activities. The data are being further examined and end of year feedback from Facilitators will explore these findings further.

Table 13. Facilitator responses about ways youth were engaged in WGG activities

Statement about engagement in WGG	None of the youth (1)	(2)	Half the youth (3)	(4)	All of the youth (5)	Total # response	Average
Youth exert the effort necessary to learn the skills needed to completed the activity	0.00% 0	4.17% 1	20.83% 5	50.00% 12	25.00% 6	24	3.96
Youth attended the task and were not distracted by other things	0.00% 0	4.17% 1	25.00% 6	50.00% 12	20.83% 5	24	3.88

Statement about engagement in WGG	None of the youth (1)	(2)	Half the youth (3)	(4)	All of the youth (5)	Total # response	Average
Youth planned how they would approach the design activity.	16.67% 4	8.33% 2	25.00% 6	16.67% 4	33.33% 8	24	3.42
Youth monitored their work on the activity	8.33% 2	0.00% 0	25.00% 6	29.17% 7	37.50% 9	24	3.88
Youth evaluated their design.	4.35% 1	4.35% 1	4.35% 1	34.78% 8	52.17% 12	23	4.26
Youth revised their design	21.74% 5	4.35% 1	17.39% 4	34.78% 8	21.74% 5	23	3.30
Youth were connecting to the activity in an emotional way, expressing positive or negative reactions about the activity	0.00% 0	0.00% 0	20.83% 5	20.83% 5	58.33% 14	24	4.38
Youth expressed interest in the activity	4.17% 1	4.17% 1	12.50% 3	33.33% 8	45.83% 11	24	4.13
Youth tried to complete the activity	0.00% 0	0.00% 0	4.17% 1	8.33% 2	87.50% 21	24	4.83

Although the B&GC Director reports listed the approximately number of males and females participating in WGG activities, the Facilitator survey asked about the level of engagement in WGG activities by gender. Facilitators were asked if they felt that the WGG activity was more engaging for females, males or both were equally engaged. The vast majority of Facilitators reported that they felt the activity engaged males and females equally (88%).

Table 14. Number of Facilitators reporting males or females were more engaged in the WGG activity

	Percentage Responses	Number Response
Females were more engaged	4%	1
Males were more engaged	8%	2
Both were equally engaged	88%	22

Facilitators were then asked to explain their responses. One Facilitator noted, “It was easier for the girls to work with the girls. And I found that the boys were easily distracted. They needed more motivation.”

Facilitator Responses about Differences between Boys and Girls Engagement in WGG (verbatim quotes from Facilitators)

- *I cannot answer effectively since we only had two girls attend, and one had to leave early. The remainder girl did not want to be in either group since it contained only boys, so she took pictures...*
- *None.*
- *The children worked well together. Each group consists of boys and girls.*
- *None. Both genders seemed very excited about this project, especially after they learned they could test the final product out on their own personal smart phones.*

- *Both genders seemed equally interested in prosthetics, and the individuals who may need them.*
- *Our Club currently caters to a much larger percentage of males at the moment.*
- *This activity saw the boys and girls work together without any issues and many formed mixed groups rather than all boys or all girls.*
- *It was easier for the girls to work with the girls. And I found that the boys were easily distracted. They needed more motivation.*
- *The activity certainly engaged both gender groups equally, our only issue is that we definitely had more males participate than females simply due to attendance at the Club that day.*
- *On average, most females enjoyed making their Avatar, and tried to make Avatars that looked like themselves. On average, most males enjoyed making their Avatar, and tried to make Avatars that did NOT look like themselves, but ones that looked 'cool' or 'silly'. This was an interesting observation.*

When asked about how youth worked together to complete the WGG activity, Facilitators typically described collaboration that was specific to the activity (e.g., one member would hold a piece of the structure while another did the work or repair). Collaboration will be further explored in 2016-2017. Another topic that will be explored in 2016-2017 is how youth collaborate (talking, sharing photos, working together, etc.). Pilot work for WGG had suggested that engagement in WGG activities sometimes served as a catalyst for engaging youth who normally do not work together and might lead to understanding of differences among youth.

Facilitator Reports about the Ways Youth Collaborated on WGG Activities (verbatim quotes)

- *They all discussed the design before building it. They also tested the path as they built it. When they noticed the marble was moving too fast at a specific point they collaboratively discussed how to fix it.*
- *The youth decided to work in groups because some new more about coding than others. Others had used scratch before so they helped each other with the codes.*
- *I saw the youth working to speed up the process by assigning members to different tasks. Rather than work one ingredient at a time the members separated the tasks to get it done quicker.*
- *I saw a lot of situations where one member would hold a piece of the structure while another did the work or repair.*
- *They listened to each other's ideas.*
- *Students broke into groups, with each student performing one half of the task needed to create the polymer. This way, they were able to "come together" similar to the ingredients in the actual project*
- *The youth helped one another when making their speakers by helping one another set up.*
- *Their dialogue was phenomenal.*
- *They teamed up and tried to assist others where they did not understand how to implement the activity*
- *Students/groups needed to work together in measuring the coils to the proper length of 6 feet. Many measured, while their partners assisted in the cutting. Some groups assisted other groups in the best methods they found to sand the ends of the coils as well.*

- *Many groups decided to work together by using the smallest/least weighing student to be the one to test out the leg. The students really had to work together in measuring the appropriate length and size to promote effective walking. Interestingly, the students took a lot of time to make the design of the leg appealing to the eye as well. Students meticulously discussed color, size, and even design.*
- *Students who participated in WGG last year help the new students in the log in process and creating their avatars.*
- *Thinking and trying different ideas as to how to make the slime bouncier, stretchier or stickier.*
- *They didn't have to collaborate on this activity.*
- *I saw a lot of groups divide up the tasks with their speakers. For example, one group had one member coiling the wire while the other taped the magnet on while the final member got the alligator clips and jack ready.*
- *Discussing their designs with one another, modifying their designs while they were building their legs, figuring out and verbalized get how to attach the legs to their knees to test them.*
- *We noticed that the students did well collaborating on when it came to figuring out who would be the tester know that they had to figure out the height of the leg.*
- *They worked individually on this activity.*
- *The kids quickly identified their skills and used them appropriately. For instance, each group seemed to have one member who was a talented artist or could at least draw, so that kid was usually assigned to draw and refine the designs.*
- *Students were helping each other with coiling the wire and adjusting their different pieces to make their speaker work..*
- *This activity was primarily independent and did not see any collaboration between the youth other than sharing which chips they liked the best.*
- *Some of the students decided to work together on the different tests of the potato chips while others chose to do it independently. It was interesting to watch the students who worked together discuss their results and figure out a way to make it an "average" between both of their results.*
- *My 7th graders worked collaboratively with the 6th graders, when some youth were having trouble testing and filling out the information, our older members stepped up and helped resolve those issues.*
- *This activity was also combined with the avatar, and a lot of the kids worked together to make their avatars look as close to themselves as possible. They would also help each other figure out where certain facial features were when they couldn't find them.*
- *Youth worked individually on this activity, but enjoyed sharing their completed Avatars with each other.*

Challenges to Implementation

A key task of 2015-2016 was to identify challenges to implementation of WGG. Based upon data collected from Facilitator interviews, Facilitator surveys and the B&GC Director reports about the challenges encountered during 2015-2016 major themes emerged related to the use of technology, staffing implementation and competing with other activities. Technology issues

continued to be one of the greatest challenges to clubs. Technology issues were related to the *WISEngineering* system, the tablets, and the club Wi-Fi access. Most common technology based problems noted by club Facilitators were the freezing and timing of tablets. This slowed many club Facilitators down. Other comments discussed were difficulty logging in and the need for a Spanish language option. The project team made several refinements to *WISEngineering* which addressed some of the challenges, although translation to Spanish is not possible with current funding. In terms of general challenges of using WGG in the club (implementation and instructions), Facilitators noted that some student's responded negatively because there were many questions, and that the activities felt too "academic." Similarly, one Facilitator mentioned that the project was time consuming. Some Facilitators noted they encountered challenges related to recruitment and retention particularly since WGG has an evident learning component. As one Facilitator noted "*Most teens who attend our program after school are looking for leisure time free from stress, or anything that has to do with a learning environment.*" One Facilitator noted difficulty recruiting students within the desired WGG age range. Similarly scheduling difficulties were sometimes reported, particularly being able to complete the projects in the desired timeframe due to competing afterschool activities or B&GC sponsored trips. Two Facilitators mentioned being short of staff, and as a result experienced difficulty managing the project

Challenges with WGG Activities and How Challenges Were Addressed (verbatim quotes from Facilitators)

- **Technology based:**
 - *The school's internet would kick the tablets off of the network and it also requires us to connect, go to Firefox and open a new tab to get permission to join the network.*
 - *Tablets sometimes freeze or do not reach wi-fi.*
 - *Some lessons do not allow for group log-in, they freeze up.*
 - *Using the tablet made it harder to implement the program because the website was not user friendly*
 - *The website did not have a foreign language (Spanish) option. Four of our students felt at a disadvantage because the site had to be translated.*
 - *On several occasions we had to restart the tablet because they would freeze, or the app took 'forever' to load the student's project.*
 - *The use of the tablets presented several challenges including, but not limited to, log in issues, freezing, malfunctioning, timing out, or not allowing them to continue without returning to the very beginning (this often occurred during the steps that would ask youth to click and drag statements into boxes), members and staff alike would get easily frustrated. To avoid the use of tablets we temporarily utilized the desktops in the computer lab to complete the data entry on the computers – this being much less stressful than using the tablets.*
 - *Using the software, whether it is via the tablet or desktop. Members always have a difficult time logging in, even with the shortcuts we have given them, and it makes the start of each session bumpy. If the use of access codes was removed I think it would make the projects go much smoother as they would simply need to log in and pick the project they want to work on.*

- **Implementation and Instructions**
 - *Occasionally the Facilitator's guide had directions that didn't match that of the tablets which complicated project procedures and outcomes.*
 - *It is time consuming and takes away from the experiment when I need to stop and translate for a separate group of students to keep them engaged in the activity. If translations were available, it would help with moving the project forward.*
 - *The kids felt like they were in school because of the design of the website and the series of questions.*
 - *They didn't like the academic part of the program. They really enjoyed implementing the actual project.*

- **Recruitment and Retention**
 - *The hardest challenge of WGG is convincing possible students that the program can be fun, interesting, and insightful to invest time into in an afterschool setting. Most teens who attend our program after school are looking for leisure time free from stress, or anything that has to do with a learning environment. Recruiting students can prove to be difficult, especially among teens.*
 - *It has been difficult recruiting children to the program, so we are actively working on creative ways to get them involved and keep them.*
 - *There are so many other options for our members, whether it is at the Club itself or at school that WISEngineering competes with. It is also difficult because some members who show particular interest may be too young or too old for the program. Lastly, it is tough because since the pool is so small (sixth through eighth grades), some of the activities are repeats for members who were in the program last year.*
 - *There are several days off and breaks throughout the school year. This has an effect on what programs we can reschedule for the following week. This year we are having an annual schedule to avoid schedule overlapping. When the days and schedule of the WISE program keeps changing, our learners do not develop consistency in turn they may not take the program seriously.*

- **Scheduling/Other Club Activities/Available Space**
 - *WGG also can compete with in house activities like talent shows, trips, or sport events.*
 - *Finding and creating a perfect schedule for the program that allowed for the successful completion of projects and heightened member engagement was a process involving trial, error, and redesign. The implementation of a new schedule towards the end of this reporting period has worked the most successfully of all previously run schedules.*
 - *This is primarily an organizational issue, but it can be difficult to complete a project within our timeframe for activities due to how busy our schedule is for the members. We have the option of running activities across two or more sessions, but this runs the added complication of people missing the second or third session after starting it week's prior.*

- *Triple play is one of the most popular programs at the clubhouse. Kids who leave school and come straight to the Boys and Girls Club are very excited to be there. However, for the first hour they arrive at the club, they all take part in “Power Hour” or homework hour. While this insures that all members complete their homework with assistance from club staff or volunteers, which gives them a total of about 1 hour and 45 minutes to engage in fun and or social emotional activities. Also, when we have special events at the clubhouse it distracts them to the point where sometimes if an event falls on a WISE day, I cancel it for the following week. Trips are another challenge. While we always try not to overlap scheduling, it is sometimes bond to happen. If there is a trip that falls on a WISE day, we again cancel it until the following weekends.*
- *Due to lack of space at our Remington Boys and Girls Club clubhouse, the room that is used to facilitate WISE Guys and Gals is constantly being interrupted by members coming in to pick up their backpacks to go home or something else. WISEngineering is a unique program which requires focus and discipline. It is a challenge to have either with constant disruptions in and out of the room. In addition, because there are so many kids in the building after school, the noise level could make it more difficult for them to focus.*
- **Staffing**
 - *I had volunteers but they could only stay for a limited amount of time. For some modules I didn’t have any help so it was more work than usual managing the whole project.*
 - *It was challenging not having a regular active staff member to assist with the projects.*
- **Age Requirement**
 - *All members are encouraged to participate in STEM when they are in attendance at the Club on days when S.T.E.M. is scheduled. While some members participate in other programs and activities (dance, cooking, field trips, etc)., and others get picked up early (sometimes right in the middle of a project) it is often a challenge to have at least 10 members complete the project in one session – if often requires two or more. Many members who do not yet meet the age requirement often express interest in the STEM projects. We do often run additional sessions to allow for younger members to participate separately and gain interest in STEM.*

Technical Challenges to implementing WGG

Facilitators were also asked as part of the Facilitator survey to describe any technical challenges they/youth encountered while completing the WGG activity. Half of the responding Facilitators mentioned having no technical difficulties. The most common mentioned difficulty involved freezing of the application (4 responses). These issues have been addressed by the WGG programmer team.

Technical Challenges Reported by Facilitators (verbatim quotes)

- *There were none*
- *No technical challenges*
- *No challenges*
- *No issues*
- *none*
- *None.*
- *None.*
- *None.*
- *None*
- *None.*
- *No technical challenges.*
- *There were no real technical challenges.*
- *No technical challenges with the computers.*
- *No technical challenges at all.*
- *There were no technical challenges with this activity.*
- *None.*
- *Out of the three accounts that were signed on to (Reid, Hazel, and Nadia) only Reid's account was allowing him to move forward past the part where they had to write about their designs and test out hoping on one leg. Nadia and Hazel's accounts froze and were not allowing them to move on, even though they completed, tested, and redesigned their legs. Reid was the only account that was not getting the error message that the other two accounts were getting; even after rebooting and resigning into their accounts.*
- *The site seems not to always open up on internet explorer we sometimes have to log members out then back in all over again.*
- *We were unable to complete this activity on the tablets due to all of the student accounts, mine included, freezing after inputting their materials in the chart to calculate overall cost of the materials. We completed the project, tested their designs, and redesigned and tested during this session; but couldn't document it on the project run due to this freezing issue. I had the students log off and log back into the site and it was unable to go back in to past that same page.*
- *We had some issues with the back button. Earlier in the day, my account was unrecognizable. Before the activity started, one of my members' account was also unrecognizable.*
- *As I mentioned above, logging on is usually the biggest challenge. The kids rarely remember their usernames and sometimes have trouble inputting the access code for the project. Since many kids are quicker than others, it is sometimes a challenge to have them all do it at the same time.*
- *The tablets we used froze and we had to restart the tablet to use them.*
- *Loading gets stuck on 50%. Students needed to log back into their accounts.*
- *Some of the students were not able to open the activity on the tablets even when access codes were given and added on the home page.*

Challenges dealing with WGG content

As part of the Facilitator survey, Facilitators were also asked to describe any challenges that they or the youth encountered related to the content while completing the WGG activity. Eleven Facilitators mentioned having no challenges. Among those who reported a challenge responses varied widely (e.g., need for additional resources) and were specific to the activity or to WGG in general (e.g. issues with the logging in or video did not work on tablet or computer).

Facilitator Reports of Content Challenges Encountered When Completing the WGG Activity (verbatim quotes)

- *The students immediately cut the card stock before testing it.*
- *Many of the students felt there wasn't enough tape until they revised their design.*
- *I felt more bowls and glue could have been provided to accommodate the 15 participants. Most students wanted to work alone on this particular project but could not.*
- *There were no challenges for this project.*
- *video did not work on tablet or computer*
- *None.*
- *None.*
- *No content challenges at the time.*
- *None*
- *None*
- *None.*
- *No content challenges for the youth or myself on this activity.*
- *There were no challenges for this activity.*
- *There weren't any content challenges.*
- *Many students forgot their user names and passwords. Also, while adding the activity on the tablet, some students still could not access the project. These students had to try again on a laptop to actually take part in the activity.*
- *This activity was pretty straightforward and the only issue encountered was getting the new students to log onto the website.*
- *They didn't understand the concept of trying to sign on as a group since this was the first time. They seem to have overcome their fear.*
- *Some didn't know what optimum meant.*
- *Reading about the electromagnets was tough for some groups but any time they had questions my staff and I were on hand to answer.*
- *Students had a difficult time understanding the concept of an electromagnet and how there was no "battery" need to make the speakers work (we went through how the power was being provided from the computer and how the electromagnet was just allowing sound to be projected not power the speaker).*
- *Some members were very new to coding and had difficulty understanding the system. After some time they got the hang of it.*
- *They had trouble establishing whether grease was a good thing or a bad thing. I believe the change from having the 'most salt' be 4 to the 'most grease' be 1, may have confused them a bit.*
- *If the site had a central location for the members as they create accounts that would be*

helpful and not only just in the projects in themselves.

- *I think the major challenge the kids had was adjusting the height of the legs for the kids that were chosen as "test subjects." Groups with shorter kids generally had an easier time while other taller groups struggled to "extend" the prosthetic.*
- *Youth wished there were more choices. Youth wished their Avatar (which was big in the Avatar creator) wasn't so small when viewed in the WGG program.*

Challenges dealing with WGG materials

Facilitators were also asked to describe any challenges they encountered related to use of the material or environmental. Out of 23 responses, nine club Facilitators reported experiencing no issues. Most common environmental challenges mentioned by Facilitators was related to limited space (3 responses) and noise within the club (2 responses). Four Facilitators identified challenges with somewhat related to the needing more materials (e.g., One Facilitator noted “Many of the students figured out that 2 or more magnets increased the quality of the sound”).

Facilitator Descriptions of Any Material or Environmental Challenges (verbatim quotes)

- *There were none*
- *This was a rather straight forward computer based project and didn't encounter any issues*
- *The only environmental challenge was having enough space in the kitchen for all groups to work at the same time.*
- *Some students elected to build their structures on the floor, which made for an uneven base, but this was their choice despite advisory from the staff.*
- *none*
- *Since our Club was closed due to the weather on our normal WGG designated day, we tried facilitating the event the following week during normal "Recreation Hours". Some students seemed distracted with their surroundings, and many asked for food/snack breaks during the project.*
- *We may have need more magnets but that was all.*
- *none*
- *Many of the students figured out that 2 or more magnets increased the quality of the sound. There were not enough magnets for every student to use 2 or more*
- *Our facility has limited spacing, making it hard for the students to find the appropriate space to truly test the leg. Originally we planned on testing them outside, but the weather did not cooperate on this particular day. We were still able to make due with the spacing we had.*
- *Our facility is very limited in space. Having 17 students in our computer room was a bit challenging to facilitate.*
- *we had to add more glue and borax to most of the team's sample just to clump up.*
- *No material or environmental challenges.*
- *There were no real challenges in this activity. Some of the groups had trouble figure out how to get the cover off the jacks, but that was minor.*
- *None for this activity*
- *The youth seemed to think that there should be better materials for the knee part of the*

leg.

- *There were no material or environmental challenges.*
- *Other than tape getting stuck in some weird places, there were no material/environmental challenges.*
- *The club is very loud and it was difficult for the students to test their speakers due to the noise volume by counselors and other kids who were not involved in the activity. Students were able to successfully test and create their speakers after many tests and asking these kids and counselors who were not participating to quiet down.*
- *The only challenge was making sure not to make a mess with the chips. It wasn't a big problem but there were definitely some crumbs.*
- *The club is very loud at times and it makes it difficult to converse with the students at times. Also, the counselors sometimes are engaging with the students who are not a part of the STEM Club activities and are distracting to the others who are.*
- *We didn't have any issues with this project. This was an easy one!*
- *None.*

General Feedback about WGG Experience

Facilitators were asked to describe any “ah-ha” moment that occurred during the activity for themselves or the youth. The verbatim responses, presented below, reveal engagement and enthusiasm. (e.g., The groups were extremely excited when the first group was able to get sound from their cup). The data also suggest youth are learning science (e.g., Once the mixing of the two bowls containing the glue and the borax happened, I felt the students finally understood how polymers reacted with one another. The clumping together of the two was a true learning experience for the students) and about design (Students loved redesigning their speakers using the different thicknesses of wire and the amount of magnets. They each revised their designs 3 or 4 times until they were successful.) The value of asking Facilitators to identify an “ah-ha” will be explored further as the assessment materials are revised for use in 2016-2017.

Facilitator Reports Of an “Ah-Ha” Moment That Occurred during the Activity (verbatim quotes)

- *The students were extremely excited when they saw another group's completed project.*
- *When the first group was finished the entire room celebrated when they saw the dancing sprites.*
- *One fun moment was when one group had the idea to add food coloring to their slime to make it different colors.*
- *One particular ah-ha moment was when one group, who built their structure first, realized they couldn't just drop the books on the tower but had to place them gently.*
- *They saw how an angle and position of their track can slow or stop the marble.*
- *Once the mixing of the two bowls containing the glue and the borax happened, I felt the students finally understood how polymers reacted with one another. The clumping together of the two was a true learning experience for the students.*
- *The ah-ha moment was when they heard the speaker working.*
- *The groups were extremely excited when the first group was able to get sound from their cup.*
- *The tighter the index cards were rolled, the stronger they became.*

- *Many students quickly learned managing of the coil was vital to the quality of sound. They also were able to figure out that one magnet was not as effective as using 2 or more.*
- *After some troubleshooting, the youths were extremely happy when they were able to figure out the most effective way to distribute weight on the prosthetic leg. Once the students were able to walk successfully with the attached leg, they were really able to get a feel for the true dynamics of the prosthetics.*
- *After adding more glue, the youths saw that a clump was beginning to form and they were able to pull out the clump and form it.*
- *For each group, the biggest ah-ha moment was when they first heard the sound through the cups.*
- *When the students realized that they had to measure their partner's leg to the floor to be able to make the prosthetic leg fit comfortably under their knee.*
- *the youth realized that they had to give the leg support not only with the tape but up the sides of the leg its self*
- *Once we finished the activity was the ah-ha moment because at first youth didn't seem to interested but in the end they enjoyed the activity.*
- *I think the biggest moment for most of the groups was when they realized they could use their shoes as part of the design, sort of as an anchor or base for the leg. Many also used it as another way to support the leg, attaching the prosthetic directly to the shoe.*
- *Students loved redesigning their speakers using the different thicknesses of wire and the amount of magnets. They each revised their designs 3 or 4 times until they were successful.*
- *I think the most interesting moment was when the kids found out which chips were their favorite based on their findings. Many of the kids came in with a preference, only to find out that they actually preferred a different brand based on the math.*
- *Students loved seeing the different amounts of oil that were shown from each potato chip.*
- *Without the bias of brands, youth were surprised to see how different their opinions of chips changed. The generic brand was very popular and tied with the Lays brand. (Last year, generic brand won!)*
- *For some of the newer members, the primary ah-ha moment was figuring out the interface for the first time and how to move from step to step. I tried not to direct them as much as I did last year to challenge them to figure out the interface on their own. Most of them did it without too much issue.*
- *Several youth enjoyed learning how to manipulate the appearance of their Avatar, and got excited when opening a new option (hair, eyes, background, etc.)*
- *None.*
- *The youth weren't really interested in this activity.*

Additional support needed

Facilitators were also asked to describe any additional assistance in regards to training and materials that they believed would have helped them to better facilitate the activity. Half of the responding Facilitators reported not needing any additional assistance. Three mentioned that the activity was “well designed” and “straightforward.” When Facilitators requested additional

training it tended to be focused on the specific activity, such as more training about how electromagnetics work or coding. Three Facilitators mentioned that examples of the finished projects that could be shared with youth would be helpful or a video they could share with youth.

Facilitator Response about What Additional Training or Materials Would Have Been Useful (verbatim quotes)

- *This activity was well designed.*
- *Maybe a better crash course for first time coders*
- *Nothing comes to mind.*
- *Possibly a set weight for the books would be helpful as some students used books that were clearly heavier than other groups.*
- *none*
- *A think a video of students and their final products always serves as a good reference for those who participated. Video instruction by the students with materials in hand would be great to help direct the youths as well.*
- *Just more magnets.*
- *Use of video. add a popsicle version of this activity. Add different types of support to the experiment.*
- *I believe more pictures of the final product (in more angles) may have helped with the construction process. Perhaps even a video of students testing out their finished speakers as well.*
- *Some of the students really had a tough time getting started on the design of the leg. Perhaps more pictures of examples using our specific materials or even a video of students troubleshooting/testing their designs may have helped*
- *None.*
- *A video like this <https://www.youtube.com/watch?v=jnDlPZCcUBc>. This particular slime was less messy than what we were dealing with.*
- *No additional assistance needed.*
- *A video about how electromagnets work may have helped in the reading section.*
- *None.*
- *If there was plastic bottles to cut out like in the hover above it all but to suite the prosthetic leg challenge would be great.*
- *This activity was pretty simple so no additional materials were needed.*
- *This is personally my favorite project and has the run the smoothest so far, so I cannot think of anything else to make this project better.*
- *None.*
- *This project is very straightforward and I cannot think of anything else it needs.*
- *None.*
- *An activity with Spanish translation! I do my best translating but it becomes very time consuming to switch between languages to make sure the members are getting the information they need.*

Feedback and Recommendations for B&GCs

The evaluation team asked Facilitators and B&GC Directors to provide any feedback or recommendations that would improve the project for the 2016-2017 year. Although feedback varied, common themes mentioned were to have (1) more resources on STEM to reorient Facilitators about the WGG subject areas and (2) to provide more materials to assist with the execution of WGG activities. Facilitators also reflected on the importance of planning for club activities, making sure that all materials and modifications were prepared in advance. Many, recounted that they experienced unexpected issues and as one Facilitator noted preparing ahead would prevent “retention issues.” Additionally, Facilitators stressed the importance of encouraging student’s excitement since for WGG activities were sometimes initially met with apprehension by many students. One Facilitator commented, “*A personal favorite experience (Sean) is when members express that the project/topic is boring, but by the end of the program time they are so engaged that they didn’t notice an hour had just went by, or they ask if they can stay in the room longer to continue working on their project.*”

Reflections and Recommendations about WGG (verbatim quotes from Facilitators)

- *Have help from staff or volunteers to run the projects. Try or explore the activity in depth before implementation. Understand that there will be kinks to work out and sometimes things don’t always go as planned. Be aware of the member’s availability.*
- *I like the structure of the program itself but making the app more user-friendly would help a great deal for the members. Provide a “How-to” notecard for anyone new to the program and for anyone using the tablets.*
- *If implemented properly, this project has real potential to add to the diversity of a Club’s programming. Facilitators must take the time to familiarize themselves with the activity and the questions. Allow for time to fully set up the materials before the students arrive, and be sure to have the students logged in beforehand if possible. It has served me well to have an example of the project nearby to have a deeper understanding of the complete outcome.*
- *I feel implementation would be smoother if the activities included video instructions, perhaps from youths in the same target age. The use of more visual aids in the projects can help foster a better understanding of STEM and help the construction piece go a little faster and more efficiently. Facilitators should be prepared in the case that a project runs a session longer than expected.*
- *Prepare in advance and review experiments and modify according to your group of youth. Always be enthusiastic, if you are excited, the youth will become more involved. Depending on the amount of youth, have support staff available to help with the activities.*
- *I would say having the supplies available in advance. In reference to communicating STEM knowledge to youth, it would be helpful if a visitor or representative from WISE be available to convey their passion for the STEM topic. I believe hearing from an expert in a field would further engage students and would make it easier to answer questions that may not be my specialty.*
- *Have snack time, but don’t make it too long, get into the project as soon as possible so the interest of the kids is not lost, don’t talk too much, remember to charge tablets, remember to take pictures.*

- *Do not assume that you and your youth will be able to complete a STEM project in one sitting. More often than not, two or more sittings are required to fully complete a project.*
- *If a project is complete, but members complain that they want more time to work/play/design – give them the opportunity to do so. It means that they are interested and curious. We have found that some of the best learning and most creativity occurred after the project was completed, when there weren't steps/instructions, but when members were free to use what they learned to continue, try their own ideas, and move forward.*
- *A review of STEM vocabulary, or words that often appear throughout multiple STEM projects, prior to beginning the first activity might be beneficial. Review words and phrases like Constraint, Specification, Criteria, Rubric, Design Challenge, Design Cycle, Engineering, etc. This process will help highlight the fact that this vocabulary will be a part of all STEM activities.*
- *If members are not interested from the beginning, don't give up. Children at this age are often self-conscious of exhibiting interest in something too quickly – sometimes for fear of what their peers might think. 'Is it cool to think that this is cool?' A personal favorite experience (Sean) is when members express that the project/topic is boring, but by the end of the program time they are so engaged that they didn't notice an hour had just went by, or they ask if they can stay in the room longer to continue working on their project.*
- *Set up the program space (supplies and materials, sharpen pencils, arrange chairs and tables, decorating a chalk board/white board with the title of the project and printed pictures of the project's topic) prior to the group showing up for the project.*
- *Printing and displaying pictures related to the topic creates a buzz as soon as members enter the room – before the project has begun and even before I have started talking with them about the topic. Members become curious and wonder how the project they will be working on today will relate to the pictures they see.*
- *First and foremost, change all of the passwords for all of your members to the same password. This saves tremendous time because none of the members will remember their password (especially since it is generated by the system) and makes it an easy announcement similar to providing the access codes. Second, I would advise reading through the Facilitator guides before the project and, if possible, trying it yourself. This will allow you to better judge the time and space needed for the project so you aren't caught off guard when running the project itself.*
- *My advice to other clubs who will be joining the WISE project next year would be to get excited with your WISE engineers. Teach them the importance of being unique and forming their own original ideas. I recommend if a session is with 15 learners, have a co-Facilitator or volunteers working with the learners as well. Lastly, plan your WISE schedules in advance to prevent retention issues and come up with creative recruiting strategies for middle school students.*

Conclusions and Next Steps

During 2015-2016 a great deal was learned that will inform WGG activities in the next year. The WGG activities were found to be easily implemented at B&GCs, despite club Facilitators sometimes (perhaps often) adapting the materials to best fit within their particular club structure. However, all club Facilitators were enthusiastic in their support and interest in using the activities. Discussions with B&GC regional leadership along with observations during 2015-2016 suggest that club Facilitators often focus on “activity delivery” whereas WGG is asking for a focus on “activity process.” These sometimes competing goals may at times challenge delivery of WGG according to the prescribed protocol. WGG is re-examining its procedures, in particular increasing the flexibility with how clubs can deliver WGG. Furthermore, WGG is planning to develop training materials for Facilitators that will help them learn how to implement activities that focus more on process. These will be different from the professional development videos that focus on implementation of the activities (e.g., the “how tos”).

The procedures that WGG have developed, including the approach to developing training videos, were found to be highly effective and could probably be easily replicated by other projects. We are still interested in collecting more data specifically through participant observation during activities at clubs as well as student, Facilitator, director interviews and focus groups. This qualitative data will allow the evaluation team to better understand the experience happening at the club and student level. We are also hoping to collect more data from students during year 3 including surveys that would ascertain student interest in STEM prior to involvement in WGG as well as their experience with the activities. During summer 2016 the *WISEngineering* data will be analyzed and follow-up interviews conducted with Facilitators and Liaisons.

Appendix A. Site Visit Protocol

WGG Site Visit Observation

Observer:

Site:

Date:

Time:

Facilitator:

Other Support Staff:

Number of Students:

Physical Space Description (size, technology, wifi):

Overall Impressions: (any general thoughts about the activity and visit)

Facilitation: (How did the Facilitator introduce the activity? Were they prepared with setup? How did they group students? How did they have students complete the online and hands-on components? How did they facilitate student discussions? How did they structure/manage the time?)

Technology: (focus here on use of tablets versus computers, youth log-in, wifi issues or concerns, how the Facilitator moved between technology and hands-on components)

Student Engagement: (When were students most engaged in activity? When did they lose interest/engagement? Did they struggle with any parts of the activity? Did they complete the activity? Did they take ownership of the activity? Did they ask questions? – Give as many specific examples as possible)

Student Learning: (What do you think students learned? How did you see student learning? What do you think students did not learn that was part of the activity?)

Any student quotes that were memorable:

Observed Challenges:

Feedback for Club/Recommendations:

Photos (you can take photos so long as they don't have obvious student faces in them – physical space and setup of materials, final products)

Appendix B. Best Practices for Clubs (designed by Co-PI Melissa Rhodes)

1. **CULTURE:** create a Culture of STEM and having it as an aspect of the strategic plan, vision, or course of the organization. The success of the implementation requires organizational commitment and investment. Don't just be in this for the money. There needs to exist an understanding that this program is in the research and development stage (*Process vs. Product*), and it is advantageous of the Club to use their position in this grant to leverage other opportunities.
2. **STAFF:** having the appropriate staff member in place to facilitate the program works best. The staff member (or volunteer) is invested, energetic, organized, and communicative. It is equally important that this individual forms relationships with the youth and meets with the kids beyond the activity. Some Clubs have co-Facilitators, assistants, etc. to help with the activity instruction.
3. **COMMUNICATION:** Your liaison is part of the larger WGG team and a vital aspect of the implementation and execution of this program. Establishing credible lines of communication is key and keeping set appointments will help establish a relationship formed on trust and respect.
4. **PARTICIPANTS:** some Clubs choose to focus on one group in the Club (i.e. Group 6 is Middle School kids) or one grade (i.e. 6th Grade). Some Clubs reduce the # of youth to 10 kids at a time, and rotate the other group the following week (on the off-weeks, kids get "free time")
5. **SCHEDULING:** Don't set up the activity to go up against everyone's favorite program. Offer it when there is the best chance for engagement. Take advantage of half-days, no school days/holidays when the Club is open. Offer "make-up days". Making this part of the weekly program schedule and having something outside of WGG planned for the "off weeks" will insure consistency and expectations. Some Clubs offer this on Fridays when kids have no/little homework.
6. **PROMOTION:** Post on your social media outlets. Take lots of video/photos (will be requested in reporting). Develop attractive flyers to recruit members.
7. **MATERIALS:** Be proactive in collecting materials (i.e. Newspapers) that you will know you will need down the line. This will help you build deeper relationships in the community, and if you take it a step further, send a photo of the kids and their projects to the donor with their donation.
8. **INSTRUCTION:** spend some time learning about the activity ahead of time and develop a real-life connection that the youth can relate to. Sometimes, during the activity, there is a difficult question. Facilitator leads the entire group through the question to help explain it better.
9. **TABLETS/WGG ONLINE:** Take the time to set up the log-ins prior to the activity starting to make things move faster (*Must make sure each youth is logged in under their own unique username and completes the activity individually). Use the same password for all kids. Have a paper copy of the activity as back up in case you have connectivity issues. If Wifi is too weak, upgrade to a more powerful router.
10. **RECOGNITION/STEWARDSHIP:** Use a token system to track members' participation. (i.e. "Do you want to be a STEMngineer?"). Have a pizza party for kids who complete 10 out of 15 activities, or a prize. Create a buzz around this program at your Club and with your supporters. "Cherish the Artifacts" – use tangible projects to showcase to potential donors.

Appendix C. Images of diversity of physical space of clubs



Photo 1. A full view of the physical space at Hempstead Boys and Girls Club.



Photo 2. The chips, already marked and in groups, and the computers, set up on the log in screen for the Optimum Potato Chip WGG activity.



Photo 3. Variety Boys and Girls Club space where activities are conducted.