Wise Guys and Gals
Boys & Girls as *WISEngineering* STEM Learners
2014-2015 Interim Annual Report
June 2015

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 will introduce 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, will 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.

Project Goals and Objectives

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 Evaluation 2014-2015

The evaluation is documenting and assessing WGG activities and whether they are being carried out as proposed and within the anticipated timeframe. During 2014-2015 WGG focused on development and testing of the informed design engineering activities, with major goals being to:

- Establish a WGG working management structure to facilitate development and implementation of WGG activities
- Create at least first drafts of the WGG activities
- Refine and enhance the *WISEngineering* platform
- Assess the feasibility of implementing WGG at B&GCs
- Develop and plan for 2015-2016 piloting of activities

WGG has established an effective management and organizational structure

WGG leadership established committees or teams to undertake project tasks. These teams work independently to complete work and then collaborate with the full group to refine and revise their work. WGG is composed of a development team (i.e., curriculum writers,) liaison consultants (i.e., individuals who support implementation by working directly with staff at each B&GC,) B&GC facilitators (i.e., B&GC staff who oversee the project and/or work directly with the youth to implement the activities,) *WISEngineering* programmers (i.e., computer scientists who focus on technology of *WISEngnieering)*, and evaluators.

This team approach has been highly effective at completing goals and objectives during 2014-2015. It is worth highlighting the role of the liaison consultants who were assigned to one or more B&GCs. They 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 an successes. One of the liaisons is writing a facilitator guide, building upon what he learned when working with the clubs. Further, the PI also works as a project liaison to one B&GC. This has resulted in 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.

Another important reason for the WGG management success has been the systems put in place to facilitate communication and allow for frequent "check-ins" for team members. Although a number of different communication venues are used, key to success have been a) the use of Basecamp b) monthly liaison meetings and c) two meetings with representatives from all teams.

- **Virtual meetings and communication via Basecamp:** 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. The use of Basecamp is facilitating project progress and is being effectively used by the various teams to share information, streamline revisions and quickly share new ideas. Daily summaries provide to anyone who requests them provide valuable and timely information. The evaluator recommends the continued use of Basecamp.

- **Monthly meetings with liaisons:** WGG project liaisons met each month with the project PI for a full-day at the Center for STEM Research, Hofstra University. Each month updates about work with the clubs are discussed. New WGG draft activities are reviewed and frequently "tried-out" by the liaisons (i.e., the liaisons complete the design activity.) This critical phase of experiencing the design activity has led to revisions on activities as well as helping assure the liaisons can train the facilitators to implement the WGG activities. Following these meetings, feedback is given to the writers so any needed revisions can be made prior to distribution of WGG activities to the clubs. The monthly meetings are also a time to discuss any evaluation concerns and next steps. These meetings have provided a way to help assure the liaisons are able to help B&GC facilitators implement the WGG activities. Feedback indicates that having the liaisons actually complete the design task is a critical step and the evaluator recommends this approach continue to be used.

- **Full project meetings:** Two, two-day full project meetings (i.e., all teams attending) that took place in November 2014 and March 2015. The November "kick-off" meeting was attended by the project PI, liaisons, curriculum activity writers, developers, computer programmer, two representatives for the B&GCs, evaluator and Advisory Board members. The March meeting included only the full WGG teams who attended the November meeting. During these meetings ideas for potential WGG project activities were developed, progress toward meeting goals discussed and assessed, and appropriate refinements and adjustments made to project activities, timelines and materials. These meetings were essential and effective for both moving the project forward and team building.

First drafts of WGG activities have been completed

During 2014-2015, drafts of WGG activities were written by a team of three experienced informal STEM curriculum developers, two of whom have extensive expertise using and programing WISE, the platform upon which *WISEngneering* is based. Each curriculum writer served as a lead author on three or four activities, with the other writers and the members working in other capacities providing support and serving as critical friends during internal project review and refinement. Although the writers live in different states, this approach worked quite well. (As noted previously, Basecamp helped to facilitate the sharing of work in a timely fashion.)

The process used for identifying and developing WGG curriculum activities was very successful. The first list of "possible" curriculum activities were generated by project partners working in small groups during the November meeting (i.e., liaison, two representatives from the B&GC, project management, computer programmers, evaluator and Advisory Board members.) Each small group included representatives engaged in different project tasks. This approached allowed for maximum input from individuals with different expertise and resulted in over 50 possible activities. The activity ideas were reviewed by all project partners and those believed to be most interesting and

doable were identified. Following the meeting, the curriculum writers selected their "favorite" to develop into an initial WGG activity. At the same time the curriculum writers, project leadership and liaisons identified the key elements to be included in the initial activity framework. This list was reviewed many times during the first year as more was learned about WGG and the structure of the B&GCs.

After the first activities were drafted by the writers, the liaisons completed the design challenge and made adjustments as needed to the curriculum. The activity was then uploaded to *WISEngineering.* The liaisons then worked with B&GC facilitators to "try" out the activities. Revisions were made based upon feedback from the B&GCC facilitators and liaisons. This design cycle, also reflective of the informed design model which underlies the framework for WGG, was highly effective and demonstrates best practice in development. Currently there are 11 short (75 minute) and four extended (several day) WGG activities written or under development (see Table 1.) This exceeds the number that were proposed.

Table 1. WGG Activities developed or under development

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

The WISEngineering platform has been refined and enhanced

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 engaged the Hofstra Computer Science department as a partner to help enhance the *WISEngineering* platform. Many enhancements have been made beyond those initially proposed. For example, *WISEngineering* has an automatic grading feature for open ended questions. By involving individuals with computer science expertise, WGG has rapidly accelerated development of *WISEngineering,* allowed for

revisions that were unanticipated (and unimagined by the team without computer science knowledge), and engaged new participants in informal STEM education - members of the Hofstra community science department.

Guided by advice from our computer science expert and feedback from the B&GCs, it was decided to adapt *WISEngineering* for delivery on a tablet. Various options were researched, and a prototype developed. In consultation with the clubs, a decision was made to purchase inexpensive tablets for use in the clubs. Moving to an inexpensive tablet-based delivery represents forward thinking by project management and anticipation of how WGG might be used in five or 10 years. Additionally, by refining the computer versions of *WISEngineering* simultaneously, WGG is positioning itself to have the greatest potential for wide dissemination and scale-up

Another noteworthy accomplishment related to refinement of *WISEngineering* was identification of an initial list of data that would be collected for research purposes and for providing feedback to clubs. This preliminary list includes the number of design journal posts, design wall posts, video posts, and picture posts; number of steps completed; grade and maximum grade for each question; grade for each learning outcome; number of attempts, and time spent on tasks, all information will be collected and de-identified. Data will be available in both raw format (for research purposes) and displayed in tables for use by B&GC staff.

Feasibility of implementing WGG activities at Boys and Girls Clubs is demonstrated

To explore the feasibility of using the WGG activities and *WISEngineering* at B&GCs, during the past year as WGG activities were developed they were "tried-out" by youth and facilitators. Liaisons trained the B&GC facilitators who then implemented the activities with their youth. Occasionally liaisons were present when youth completed the design challenge, but typically the facilitator handled all WGG activity development and provided feedback to the liaisons. The goals were to assess whether a) facilitators could be adequately prepared to implement the activities or whether additional training was needed; b) the clubs have adequate resources to implement WGG activities (i.e., computer technology is adequate, space and time are available) and c) youth could and would complete the design challenges (i.e., was there adequate time allocated, did the activities keep youth's attention.) Feedback from these initial try-outs of the activities provided feedback to help guide revisions of the WGG activities, to design training materials, to identify additional support needed by individual clubs, and to provide guidance about how to structure and write new activities (e.g., how long activities should take to complete.)

Most youth were introduced to WGG by completing the "high five" activity, a simple introduction to the *WISEngineering* interface. A sample of youth in each clubs were able to complete this activity with minimal challenges. This allowed for a test of the computer technology, facilitators understanding of how to support youth logging into the system, and overall engagement in a very short experience. The evaluators found this approach interesting and useful. The liaisons reported

some difficulties and were able to use this experience to educate facilitators who struggled with logistical requirements such as how to log-into *WISEngineering*.

After club facilitators had completed high five with their youth, they began to introduce other WGG activities. It was quickly evidently that most B&GCs lacked the needed number of computers and in some cases needed additional connectivity to the internet. However, despite computer and internet access related challenges, no youth had problems using *WISEngineering*. In other words, the program worked smoothly. The conclusion was that the system worked but the clubs needed more resources. Based upon this information it was decided to move to a tablet platform and when needed, help the B&GCs increase their connectivity. *WISEngineering* has been adapted for use on tablets, tablets have been purchased, *WISEngineering* uploaded onto the tablets, and the tablets have been distributed to the clubs.

Table 2 displays the WGG activities completed at B&GCs between 10/1/2014 and 3/31/2015 and the number of youth participants in each activity by day. (Activities completed during April and May are not reflected here.). It should be noted that the counts are by day and therefor youth may be double counted, that is if someone participated in two activities he or she is included in both counts. During this six month period 284 youth participated in WGG activities. (Note, this represents total count, and youth who participated in more than one activity are counted twice.) Additionally, one B&GC is not represented in these data because they did not provide the requested information.

Table 2: Activities implemented by each B&GC and number of youth participants

Date	Organization	Activity	# Youth
12/10/2014	Bellport	Invitation/Intro to WGG/STEM (High Five)	20
2/11/2015	Bellport	Orientation to WGG/STEM (High Five)	15
2/18/2015	Bellport	Orientation to WGG/STEM (High Five)	16
2/19/2015	Bellport	Hi-Five	5
3/11/2015	Bellport	HI-Five	5
3/25/2015	Bellport	Potato Chip	5
11/18/2014	Grenville	High Five	18
12/16/2014	Grenville	Optimum Potato Chip	16
1/20/2015	Grenville	High Five	6
2/10/2015	Grenville	Prosthetic Challenge	7
12/1/14	Glen Cove	High Five	4
12/3/2014	Glen Cove	High Five	3
12/5/14	Glen Cove	High Five	9
12/11/2014	Glen Cove	Potato Chip	7
12/16/2015	Glen Cove	Potato Chip	6
3/11/2015	Glen Cove	Prosthetic Leg	12
N/A	Hicksville	N/A	0
N/A	Mount Vernon	Design for Sound	60
12/11/2014	Oyster Bay	Introduction & High Five	7
1/8/2015	Oyster Bay	Ultimate Potato Chip	7
1/15/2015	Oyster Bay	Ultimate Potato Chip	7

Date	Organization	Activity	# Youth
3/12/2015	Oyster Bay	Prosthetic Leg	5
3/19/2015	Oyster Bay	Prosthetic Leg	5
3/26/2015	Oyster Bay	Prosthetic Leg	5
4/2/2015	Variety	Design for Sound	14
1/15/15	New Rochelle	Optimum Potato Chip	4
1/15/15	New Rochelle	Optimum Potato Chip	2
1/29/15	New Rochelle	Optimum Potato Chip	3
2/5/15	New Rochelle	Prosthetic Challenge	5
3/5/15	New Rochelle	Prosthetic Challenge	4
3/26/15	New Rochelle	Prosthetic Challenge	4
12/15/14-1/8/15	Hempstead	High Five	27
1/9/15	Hempstead	Optimum Potato Chip	15
2/27/15	Hempstead	Prosthetic Challenge	15
4/16/15	Hempstead	Design for Sound	15

The number of B&GCs and number of youth completing each WGG are presented in Table 3. At least five clubs completed the High Five, Potato Chip and Prostatic Challenge.

Table 3: Total number of youth participating and clubs by WGG Activity

Activity	# of Clubs	# of Youth
High Five	5	84
Potato Chip	6	67
Prosthetic Challenge	5	44
Design for Sound	3	89

The number and percentage of unique youth participants was also examined by race and gender. That is, each B&GC was asked to report the number of youth participating in WGG. As is evident in Table 4, the majority of youth are traditionally underrepresented in STEM activities. It should be noted youth are only represented once in this table, which is the reason the total number of participating youth, 188, is lower than the total in the previous tables.

Table 4: Total Youth Served by Race and Gender (n=188 youth)

Race	Total Number	Percentage
African American	76	40.4%
Hispanic	46	24.5%
White	27	14.4%
Asian	8	4.3%
Multi-Racial	28	14.8%
Other	3	1.6%
Gender	**Total Number**	**Percentage**
Male	121	64.4%
Female	67	35.6%

Youth fully complete most WGG activities and engagement is high

Although the focus of year one work was to study development of the WGG activities and the feasibility of using them in a club, some initial data were collected about whether the youth were able to fully complete the activity and their enjoyment as perceived by the facilitator. As was expected, clubs varied somewhat. However, as reported by the facilitators the majority of youth completed the activities and were fully engaged

Table 5: Degree of completion and youth engagement by WGG activity

B&GC	WGG Activity	Date	Activity Completion by Majority of Youth			Youth Engagement by Majority of Youth		
			Not	Partial	Fully	Not	Partial	Fully
Bellport	Hi Five	2/19	X	X			X	
	Hi Five	3/11		X			X	X
	Potato Chip	3/25		X				X
Grenville	High Five	11/18			X			X
	Optimum Potato Chip	12/16			X			X
	High Five	1/20			X			X
	Prosthetic Challenge	2/10			X			X
Glen Cove	High Five Activity	12/1			X			X
	High Five Activity	12/3			X			X
	High Five Activity	12/5			X			X
	Potato Chip Activity	12/11			X		X	X
	Potato Chip Activity	12/16			X		X	
	Prosthetic Leg	3/11			X		X	
Mount Vernon	Don't Stop the Music	N/A			X			X
Oyster Bay	Intro & High Five	12/11			X		X	
	Ultimate Potato Chip	1/8			X			X
	Ultimate Potato Chip	1/15			X	X		
	Prosthetic Leg	3/12			X			X
	Prosthetic Leg	3/19			X			X
	Prosthetic Leg	3/26			X			X
Variety	Design for Sound	4/2		X			X	
New Rochelle	Optimum Potato Chip	1/15		X				X
	Optimum Potato Chip	1/15		X	X			X
	Optimum Potato Chip	1/29	X				X	X
	Prosthetic Challenge	2/5	X				X	X
	Prosthetic Challenge	3/5		X			X	X
	Prosthetic Challenge	3/26	X					X
Hempstead	High Five	12/15 -1/18			X			X
	Optimum Potato Chip				X			X
	Prosthetic Challenge				X			X
	Design for Sound				X			X

When asked why an activity was not completed, facilitators reported challenges learning to use the *WISEngineering* program and "running out of time" due to inclement weather. Problems related to learning to use *WISEngineering* were addressed by providing additional training to the facilitators. When asked to explain why they believed some youth were not engaged, responses were more varied. Facilitators noted that sometimes there were other activities (e.g., open gym) that were highly desirable to youth. They also stated that the break between WGG activities, often a month or more, results in youth loosing interesting. It was suggested by a facilitator at one club that the activities be group closer together to maintain "the excitement and momentum." Only one club facilitator reported that the youth did not find the activities engaging. In particular this facilitator noted that youth who were members of a "STEM" club were less engaged.

Feedback about successes of WGG activities. A facilitator at each B&GC was asked to "Please describe any successes with the program or activities." To protect the anonymity of respondents, reference to individual clubs has been removed. This feedback also indicates that youth were engaged and liked the hands-on component. The prosthetic leg activity was identified as an activity that the youth particularly liked.

Successes of WGG (verbatim quotes from facilitators)

- Students are genuinely interested in STEM activities. Many of the invitees expressed interest in doing science experiments.
- The staff members assigned to work with this program are now better versed in what to do and how to do it, including prep time and setup.
- One success is that we have identified the target group, and are engaging the parents to help us bring the kids for this program.
- The activities we have been given so far have been very successful. The members have enjoyed taking part in the activities and appreciate the diversity of the projects. They are particularly looking forward to the next activity (speaker building).
- The most engaging activity has been the Prosthetic Leg Challenge. While it may not have garnered as many kids (so far) as Optimum Potato Chip, it was certainly the most engaging. The members truly enjoyed the hands-on work and the challenge of designing and building their own construct.
- Over the past reporting phase we have observed several periods of success. First, having a set schedule allowed for optimal and consistent participation in the scheduled activity. Secondly, pre-prep for each activity helped build enthusiasm and peak interests among "learners." Participants were particularly interested in the hands on nature of the activity/tasks. During the process facilitators observed the value in having learners work in pairs and groups as well as reading the material aloud. While following the general guidelines, working in groups allowed members to develop and incorporate their own ideas.

- Considering the value in the "food incentive," the potato chip activity was conducted on more than one occasion. Members were actually surprised by the outcomes, especially when evaluating the "greasiness" of each potato chip. Group facilitators noticed interesting gasps (i.e. "eww" "can you believe we eat this?" "I don't care. It still taste good") among learners. Subtle discussions regarding health and wellness were explored. Many questions were raised regarding the actual ingredient labels. For many of the participants it was the first time in which they fully explored portion size, calories & food quality. Overall, great teaching point and learning experience that correlated nicely with a Healthy Habits component.
- By far the prosthetic leg building activity was most significant in that it really encouraged team building and abstract though. In addition each member was able to contribute in his/her own unique way. For example, we observed that some participants were stronger with drawing the conceptual image; others were helpful in the hands on construction of the actual leg; and most were concerned with building an aesthetically relevant and sound structure. Learners were enthusiastic about sharing their opinions and evaluating their own work as well as the work of others.
- Children were very engaged in the testing and building portions of the activities. Many groups noticed the flaws in their designs and fixed them in the prototype
- The students were able to: learn by trial and error, learned how to work in groups, experienced "Aha" moments and experience the satisfaction of successfully completing their assigned tasks.
- Members really enjoyed the prosthetic leg activity. They were completely engaged, most especially, during the building and design process. Computer input for this project was much more "user friendly" and clear and concise.
- The program is effective because we have been able to motivate/cultivate the program participants' interest in the STEM subjects. Some participants have shown significant improvement in the subject areas of Science and Math. The ability to devote instructional time is key and makes a world of difference in the program's success.

In addition to identifying successes, the WGG team was interested in learning about challenges that the clubs had encountered. Once again the data are presented without reference to individual clubs. The most common challenge cited challenge was finding enough time. Several facilitators also noted that youth preferred the hands-on aspects over the computer use of *WISEngineering*, with one speculating *WISEngineering* sometimes seemed too much like school work to youth. Recommendations were provided about how to enhance *WISEngineering* (e.g., provide a back button) and the ways in which activities are shared (more time needed.) These challenges will be addressed by the project team during their summer workshop and when revising the activities.

Challenges with WGG activities and how challenges were addressed (verbatim quotes from facilitators)

- One challenge has been finding the right time slot for this program, when it is not competing with our most popular programs for this age group.
- Another challenge is reaching out to middle school kids who are not yet Club members. Local district science teachers have agreed to help recruit kids for the program, but we have met with little success in convincing these kids to join our Club or even visit.
- The only challenge we have faced so far is keeping the members engaged while they are doing the activities/questions on the computer. It appears the kids sometimes get bored or bogged down with the questions portion of the projects, particularly since our activities take place after a long day of school and homework.
- We usually remedy this by breaking up the questions and introducing part of the hands-on portion earlier than planned to get the kids engaged and excited.
- Group facilitators acknowledge time as one of the most difficult challenges with conducting the activities. In order to fully complete each task, we had to allow ourselves at least 15-20 minutes to log all learners on to the website. More importantly, each activity required approximately 1.5-2 hours to complete. In addition, the actual instructions and tutorials were rather lengthy and detailed. In some instances the vocabulary and directions were unclear and a bit advanced for our audience. Clarification from facilitators helped reduce confusion and anxiety in this area.
- The hands on tasks such as building, organizing and drawing were moments in which "learners" were the most engaged. However, for the majority of "learners" the data entry component was cumbersome. Initially, participants had difficulty conceptualizing evaluative criteria, but again this was reduced with facilitator clarification. However the lengthiness and extensive detail had an undesirable effect on enthusiasm. Lastly, the learning modules were wordy and would often require the materials to be read aloud to alleviate confusion.
- Challenges for kids: Some had trouble when they accidentally clicked ahead too fast and there was no back button option.
- Some activities took longer than anticipated and created conflicts with the schedule
- Challenges for staff: the turnaround of the lessons. We should have lessons in advance, at least by the start of each month, not the middle. It makes it very hard to plan and meet objectives without the material with enough advanced.
- Where is the data going and why don't we see it right after the lesson? It would be beneficial to see the data collected after each lesson to ensure all the participants really understood the questions and were getting the answers right. This would allow staff to go over things again with kids that didn't fully understand things so the kids don't make the same mistakes in the future.
- One major challenge was time constraints. This was due largely to the fact that some students had to leave early while STEM was in progress.

- Students were discouraged with the computer (data entry) aspect of the projects. They expressed that it was too lengthy, boring, difficult to understand, and not enjoyable.
- Additionally, our Club faced some difficulty generating interest in the program. Many members have a lack of motivation toward academic activities as they perceived the program as being like a math and science class that they would take at school.

Facilitator reflections about WGG. Finally, each facilitator was asked to provide recommendations, questions, and/or comments. Although feedback varied, a common theme was to increase the engagement level particularly by adding more video links and to reduce the time between activities (i.e., not wait a month before introducing another WGG activity.

Reflections about WGG (verbatim quotes from facilitators)

- We are reaching out to some of the other school districts that we service in order to include their middle school kids in the WGG/STEM program. I believe that with the participation of these students in addition to our current members, we will be able to double or triple our participation
- We will also be planning a STEM theme for one of the tracks for our summer program. Coupled with the Summer Science Sunday field trips to Brookhaven National Laboratory, I believe this will boost the interest level for these activities.
- The only recommendation would be to make the questions/answers portion of the projects a bit more engaging or possibly shorter. The Prosthetic Leg Challenge began this process by introducing lots of interesting photos/videos, which go a long way to making this part of the projects more interesting for the younger members.
- I would also recommend continuing the trend of hands-on group activities that involve the design process. The kids seem to enjoy the challenge that these projects present and it leads to fruitful activities, even if the final product isn't as effective as the kids would like them to be.
- In moving forward, I would suggest incorporating the use of videos and more background materials to entice learning and increase enthusiasm.
- In our own experience, we have used pre-engagement materials (i.e. Youtube, magazines, icebreakers) to give learners background information on the topic.
- Unfortunately, the consistency in which the activities were administered was too sporadic. I would recommend activities planned more closely to one another in regards to timing, as this would promote enthusiasm.
- Allow the children to utilize a back button if they clicked ahead by mistake.
- Allow students the ability to go back to review answers findings.
- Kids really enjoyed the lesson but because they were so spread out each time you had to try and re-engage them because you had lost the momentum form the previous experiment. We think the program would be more beneficial if it took place over a series of weeks instead of months. This would also allow more kids to participate because it could be run in sessions.

- Provide an easier step by step or better example for the speaker set up. The facilitator had to walk every child/ group through their designs
- To promote independence within the computer portion of the projects, language that is more age-appropriate, could be more effective. The "Potato Chip Activity" in particular, used language that was very complicated for the members

Conclusions and Next Steps

During 2014-2015 the WGG project accomplished or exceeded the proposed milestones. The procedures that WGG implemented to develop activities were found to be highly effective and could probably be easily replicated by other projects. The WGG project objectives follow along with an indication of whether each goal has been met. Targeted year 1 objectives, more specific to the tasks that needed to be completed during the first year, are also presented.

Project Objectives

- Develop 9 short (targeted at 75 minute) and two longer (targeted at six hours) WGG informed engineering design activities that require engineering thinking and STEM knowledge and are aligned to the Common Core Math Standards and Next Generation Science Standards.. (objective exceeded – drafts completed, activities still to be reviewed for alignment with standards)
- Expand and enhance the *WISEngineering* platform to align with the goals for exemplary informal STEM materials and make it is more engaging and easier to use. (objective met and work exceeded expectation - interface enhanced to include a text reading/scoring function, add music, and increase or add animations/videos/pictures.)
- Develop and refine WGG training and workshop materials for B&GC staff. (objective in progress, year 1 expectations met)
- Deliver WGG to over 6,600 youth at over 25 B&GCs. (objective in progress, year 1 expectations exceeded)
- Adapt the training and workshop materials to create a virtual training delivery system so B&GC staff nationally can use and adapt the materials. (objective for later years, planning underway for work plan, year 1 expectations met)
- Study WGG activities, examining evidence in relation to claims about youth outcomes. (objective for later years, work underway, year 1 expectations met))
- Create a sustainable presence for *WISEngineering* at Hofstra with continued maintenance and support on the Hofstra server even after the completion of the grant period. (objective met)
- Provide National Department of Energy Laboratories and informal STEM providers with WGG materials. (objective in process, preliminary materials shared, year 1 expectations met)
- Publish and disseminate models, materials, products, and results. (objective in process, year 1 expectations met)

- Coordinate and collaborate with The Center for Advancement of Informal Science Education (CAISE) for use and dissemination. (objective for later years, planning in process)

Year 1 targeted objectives

- Develop and reach program consensus about activity design framework (e.g., what needs to be included, how activities are presented, etc.) (objective met)
- Create an alternative, tablet-based delivery for *WISEngineering* (unanticipated outcome, objective exceeded)
- Generate an initial list of data to be accessed via *WISEngineering* (objective met)
- Draft a facilitator guide (objective met)
- Establish working relationships with each B&GC and identify structures that are most reflective of individual club needs, structure and population (objective met)
- Train B&GC facilitators to implement the majority of short project activities and extended activities are scheduled to be delivered by the summer of 2015. (objective met)
- Try-out WGG activities in B&GCs and collect data go guide WGG activity revisions (objective met)

As noted previously, during the first year it was found that some B&GCs did not have the infrastructure needed to support WGG. Several options we considered and are simultaneously being pursued. Since clubs often lacked the needed computer resources (e.g., they had few too few computers) WGG began to move toward use of tablets. The project staff researching the most economical and easy to use tablets that could support *WISEngineering*. The computer interface was adapted for use on a tablet. One advantage of the tablet based approach is that the camera was readily available for all youth and facilitators to use. At the same time, revisions continued on the computer program that supports *WISEngineering*.

Since WGG is still in development, impact on youth has not yet been studied. However, as the WGG activities begin to be systematically used during the fall 2015 the evaluation team will begin to document and assess youth impact. Data collected from within *WISEngineering*, and facilitator liaison and youth feedback will be used to triangulate information in ways to best interpret outcomes.