

What are the major goals of the project?

- Deliver WGG to over 6,600 youth at over 25 B&GCs.
- Develop nine 1-hour and two 6-hour informed engineering design challenges that engage youth in virtual and physical design challenges that require engineering thinking and STEM knowledge and are aligned to the Common Core Math Standards and Next Generation Science Standards.
- Develop and refine WGG training and workshop materials for B&GC staff.
- Adapt the training and workshop materials to create a virtual training delivery system so B&GC staff nationally can use and adapt the materials.
- Provide National Department of Energy Laboratories and informal STEM providers with WGG materials.
- 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.
- Study WGG activities, examining evidence in relation to claims about youth outcomes.
- 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.
- Publish and disseminate models, materials, products, and results.
- Coordinate and collaborate with The Center for Advancement of Informal Science Education (CAISE) for use and dissemination.

What was accomplished under these goals (you must provide information for at least one of the 4 categories below)?

Major Activities: In summer of 2016, the BGCs implemented summer activities. Some clubs did not finish activities during the academic year and we allowed them a one-time option to complete missing ones until mid-October. There was a team meeting in August to finalize plans for the September kick-off meeting with all BGCs who would be working us in 2016. We added five new clubs, one in Virginia, two in Connecticut, two in Queens, NY. Additionally, the Virginia BGC asked that we add an additional club that they would fund, it did not participate in the September professional development and we would use information from its participation to inform our expansion in year four. The club is in rural Virginia, adding geographic diversity to the mix of clubs we are working with. A feature of this year was the introductory meeting, we all clubs attended and included their CEO as well as facilitator of activities and often a grants coordinator. The strategies for the meeting included working with the CEO's regarding needed support for the running the activities, how WGG fit within the BGC of America's agenda, and how to leverage WGG for additional resources. The strategies for the facilitators were regarding how to run an activity, the resources in terms of virtual professional development available in WGG, conducting an activity from student and facilitator perspectives. We were able to recruit the head of STEM from BGC America, Elaina Ouimet, who discussed the national perspective. The clubs implemented activities with less liaison support, using instead the

professional development resources (video and text) on the WGG website. Regarding the website, we upgraded the site and enhanced the Center for STEM Research's site to better serve as resources to clubs. Co-Pi Melissa Rhodes attended the Northeast regional BGC meeting and met with clubs who were interested in participating in year four. Additionally, she frequently travels to BGCA in Atlanta, facilitating understanding of national perspectives and how WGG aligns with them. She persuaded the BGCA to assist in identifying eligible clubs for year 4 and 5 participation. The WGG team had monthly meetings, assessing club progress, developing a new culminating activity, Shark Tank, and doing the final refinements to the activities based on evaluation feedback. The project also supported Dr. Erika Tate working with Parent's University in Savannah Georgia re using WGG STEM activities. The results of this collaborative initiative have been very positive—parents engaged, learning activities, working at home with their families conducting the activities, and often engaging other organizations (churches, civic) and conducting the activities there, too. The WGG Advisory Board met on March 10th and 11th. All board members were able to attend, we presented our efforts so far and discussed next steps with them. As a result of the meeting, the Board recommended that in years four and five, we focus on clubs that perform well, rewarding those who achieve greater numbers of participants, rather than continuing to support underperforming clubs; that we institute a badging and certificate program, where youth will receive a certificate of recognition from the Center for STEM Research for their completion of WGG activities. This is based on programs initiated at highly successful clubs, like the Hempstead BGC. Further, they were very supportive of the Parent University initiative and encouraged us to continue this effort.

Specific Objectives: Specific Objective will refer to the Work Plan Activities and Milestones for WGG. Regarding the Work Plan **Activities**—we have implemented all the activities with the Cohort I and II BGCs. Some clubs have not met their target numbers and we are providing additional opportunity to do so. We continued the refinement of all activities (12 were promised, 15 delivered, plus a new one, Shark Tank, under development), developed and refined the Facilitators Guide and developed with initial refinement of the video professional development. Further, we have developed 'how to' videos such as supporting creating youth computer accounts, logging into WGG. Creating a certificate and badging system. **Locations**—there are 15 BGCs working with us in year three and we are finalizing the recruitment of clubs for year four and five. **Professional Development**—we created PD videos and text for all WGG activities (accessible from smart devices, so facilitators can view from their phones) and expanded the PD to include support for running activities and logging into accounts.

WISEngineering Technologies—The infrastructure of the system is a hybrid architecture of web applications and mobile applications. Given the diverse network settings available at the clubs, access of the system is needed for both desktop computers and 7-inch Android tablets. The application is structured in the way that it is accessed through the standard WWW protocols, but can be displayed in both large and small screen devices. Given that some clubs have extremely slow Internet, the mobile application version also stores a cached version of all learning materials so that contents can be accessed offline (without Internet), and student responses will be collected and submitted when Internet is available. **Evaluation and Research**—the project evaluator and her team have been collecting and analyzing data from

youth work, assessing club involvement and participation, as well as analyzing the roles of project personnel. **Dissemination**— co-PI Melissa Rhodes is now a regional officer of the Boys & Girls Club of America, so she is able to communicate directly with headquarter staff regarding the project and the head of STEM for BGCA presented at our kick-off meeting in September 2016. Further, we have a BGC in Charlottesville, VA as a member club; they are situated in the southeast regional network of BGCA and have made presentations about WGG as co-PI Rhodes has at the Northeast regional conference. Co-PI Bernadette Uzzi has incorporated project activities at Brookhaven National Laboratory. Conference and journal papers have been presented and will be noted under Key Outcomes. Mr. Ken White, Manager, Office of Educational Programs at BNL, is exploring the use of adapting *WISEngineering* and WGG in their expansion of the Science Center.

Significant Results: There are a variety of significant results, such as the involvement of non-regional BGCs in Virginia, indicating the scalability of WGG other locales and the viability of the virtual professional development model we are implementing. We supported the leveraging of WGG so clubs could garner publicity and additional funding, such as \$25,000 support to the Bellport BGC and the \$1 million support to the Virginia BGCs. The professional development videos have been tested and revised, as have the activities in preparation for testing in year four. In terms of dissemination and expanding participation, something we discussed with the Advisory Board, we have developed a framework to assist in scaling efforts. We are laying the groundwork for broad dissemination, connecting with partners who would be interested in WGG and others interested in the *WISEngineering* research engine. Continuing with the theme of dissemination, we totally revised the WGG website so it is more accessible to users, and revised the Center website to promote WGG and the research potential of *WISEngineering*. Technologically, we have upgraded *WISEngineering*, including creating online/offline modes, so users can gather data offline, no longer depending on Wi-Fi connectivity, and then automatically uploading data when the tablet connects to Wi-Fi.

Key Outcomes/Other Achievements: The project has several publications promoting *WISEngineering* and WGG.

Burghardt, M.D. and Hecht, D. 2017. Scaling Up a National Science Foundation Project: Wise Guys and Gals—A Case Study. *Proceedings of Hawaii International Conference on Education*, Oahu, Hawaii.

Chiu, J. L., *Gonczi, A., Fu, X. & Burghardt, M. D. (2017). Supporting informed engineering design across formal and informal contexts with *WISEngineering*. *International Journal of Engineering Education, Special Issue: Current Trends in K-12 Engineering Education*, 33(1), 371-381.

*Gonczi, A., Chiu, J. L., & *Pan, E. (2016). *WISEngineering* hydroponics: A technology-enhanced life science engineering design unit. *Science Scope*, 39(9), 19-25.

Burghardt, M. D. and Hecht, D. 2016. Children's Engineering. STEM for All, Video Showcase, National Science Foundation. <http://stemforall2016.videohall.com/presentations/736>

Almendral, C., Burghardt, M.D., Gilken, J. (2016). WISEngineering Kindergarten Kids: A Feasibility Case Study. Proceedings Hawaii International Conference on Education, Oahu, Hawaii.

Additionally, a blog by Dr. Erika Tate provides insight into the results from the Parent University initiative, <http://www.bluknowledge.com/?p=1996>.

What opportunities for training and professional development has the project provided?

The September 16th meeting of all clubs had a separate session for the training of facilitators—having them experience WISEngineering as a youth and as a facilitator. They went through the process by doing of the WGG projects. The management team, which includes the PIs and the Liaison consultants, has been meeting on a near monthly basis throughout the year. BGCs that have problems are visited, and revisited. We have developed simple methods for testing Internet access speed, have created professional development activity videos and 'how-to' videos, such as how to create passwords for youth, how to log into the system, how to answer facilitator report questions.

How have the results been disseminated to communities of interest?

Co-PI Melissa Rhodes is now a regional officer of the Boys & Girls Club of America and communicates directly with headquarter staff regarding the project. We were able to include the BGCA STEM coordinator, Elaina Ouimet, in our September whole team meeting. The BGC in Charlottesville, VA as a member club; they are situated in the southeast regional network of BGCA and have made presentations about WGG. Co-PI Rhodes presented findings at the Northeast BGCA regional conference. Co-PI Bernadette Uzzi has incorporated project activities at Brookhaven National Laboratory. Conference and journal papers have been presented and will be noted under Key Outcomes. Mr. Ken White, Manager, Office of Educational Programs at BNL, is exploring the use of adapting *WISEngineering* and WGG in their expansion of the Science Center. Further, many clubs are using their participation in WGG with their advisory boards, garnering additional support from them and their communities.

What do you plan to do during the next reporting period to accomplish the goals?

We will continue the near monthly meetings of the management team throughout the year, it enables us to deal with any problems that arise bringing a diversity of views to bear on issues. With the expansion of new clubs not in the immediate geographic area, the team has decided not to have an all day meeting, but rather to bring supplies, tablets and materials to each club individually, meeting with the CEO and facilitator one-on-one. The goal is the have the clubs use the virtual professional development support videos and the 'how-to' videos when

implementing the activities. The Liaisons will provide on-line assistance as needed, and certainly, if required, visit and support. The implementation of the ten shorter units will begin by mid-October (some flexibility is given clubs re starting date) and continue on a weekly basis until the activities are completed. The extended time activities can be done during the academic year, and the warm weather activities will be delayed until weather permits. We will present findings at the Northeast and Southeast Regional BGC meetings. We intend WGG to be an open-source asset to all clubs. The website will support clubs accessing information, including activities. Similarly, we are developing the Center for STEM Research's website, so clubs can access materials there as well. On-going collaboration with evaluation team, BGCs and BNL. Dissemination at conferences, journal articles, continued collaboration with CAISE and Boys & Girls Club of America. We have developed a culminating activity, Shark Tank, that is being pilot tested this summer for implementation next year. In this youth create WGG activities and clubs compete with one another for the best activity with rewards associated for winning, as well as the activity being included in the WGG portfolio of materials. Additionally, we are continuing to support the Parent University initiative, gathering data from the experience, and hope to expand the scope in terms of number of parents involved and activities engaged in with additional funding.