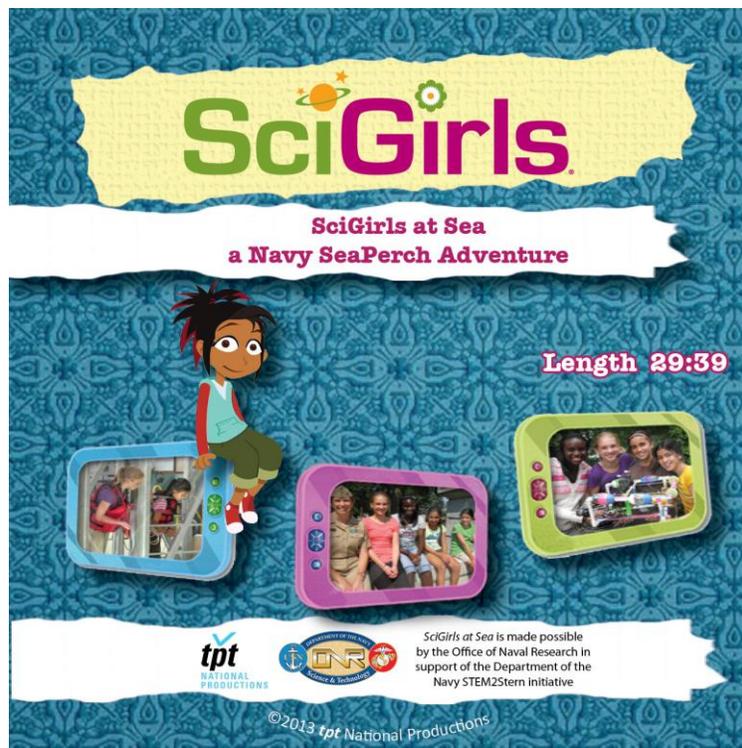




MULTIMEDIA RESEARCH

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Summative Evaluation of *SciGirls at Sea: A Navy SeaPerch Adventure* Television Episode & Webgame Executive Summary



Report for Twin Cities Public Television

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INTRODUCTION

Produced by Twin Cities Public Television, St. Paul, MN, and sponsored by the National Science Foundation (NSF), *SciGirls* is a multimedia project for upper grade-school and middle-school tweens. Weekly half-hour programs with both animated and live action are accompanied by web and outreach activities in the fields of science, technology and engineering (STEM).¹ The overall goals of the multimedia project are to 1) to foster a greater interest and confidence in STEM among girls ages 8 to 13 and their parents; 2) to deepen understanding of the most effective ways to engage girls in STEM activities and encourage them to pursue STEM careers; and 3) to connect girls to existing quality STEM education opportunities in their communities.

Each half-hour episode of the television series follows a different group of enthusiastic, *real* middle school SciGirls who collaborate, communicate, investigate, engineer and discover. They are accompanied by two animated characters – a plucky SciGirl named Izzie and her best friend Jake, who tie the series together with their ongoing adventures. Each episode begins with a story in which Izzie and Jake discover they have some problem that science can solve. Reaching out to the SciGirls, Izzie surfs the *SciGirls* website to find a science or engineering problem related to her own. While the real girls model the science inquiry process or engineering design process to solve their real-life problem, Izzie and Jake solve their problem based on what Izzie learns from observing the SciGirls' experiences.

The Season Two episode, *SciGirls at Sea: A Navy SeaPerch Adventure*, was made possible by the Office of Naval Research in support of the Department of the Navy STEM2Stern initiative. In the *SeaPerch* episode, a team of four SciGirls meet with women mentors at the US Naval Academy to learn how to design and build an underwater robot - a "SeaPerch" remotely-operated vehicle (ROV) - to investigate artificial oyster reefs in Chesapeake Bay. Associated with the episode is an online game called *Aquabot* in which players build and test a neutrally buoyant ROV and then drive it to discover items underwater.

This report presents results from a quasi-experimental study by Multimedia Research, an independent evaluation group, examining the impact on fifth grade girls of viewing the half-hour *SeaPerch* episode and playing the associated *Aquabot* online game. Pre-post interviews focused on the engagement outcomes of appeal of the episode and game; engagement with the episode/game connectivity; and interest in participating in a hands-on robotics experience as well as outcomes of learning about buoyancy, the engineering design process, and jobs that women do in the Navy.

¹ See <http://pbskids.org/scigirls/>

SUMMARY OF RESULTS

Girls in fifth grade (N = 20) were recruited around four national sites to view the *SciGirls SeaPerch* episode and play an associated online game called *Aquabot*. The girls were interviewed both before and after their experience regarding interest, engagement and knowledge.

The fifth grade girls highly rated the appeal of the *SeaPerch* episode and related *Aquabot* game. They enjoyed the engineering story of real girls designing, building and repeatedly testing an ROV and using it to help understand the Chesapeake Bay oyster environment. Viewers of *SciGirls* enjoy seeing confident girls their own age accomplishing interesting things.

Viewers were surprised by the visit to the Naval Academy. After viewing the episode, one-fifth of viewers spontaneously reported learning about jobs for women in the Navy. Pre-post direct questioning revealed a significant increase in knowledge that Navy women can drive ships, pilot helicopters, and be an oceanographer. *SeaPerch* successfully raised viewer awareness of careers for women in the Navy.

The online game of building, decorating and driving a *SeaPerch* robot was fun, although a challenge for some in the second game level. Our participants liked the experience of watching a show and then playing a related online game because the show supported successful game play and playing the game reinforced the show content.

Beyond being just engaging and fun, the experience of watching the *SeaPerch* episode and playing the game also significantly increased participants' interest in designing and building their own small underwater robot; increased understanding of the terms "buoyancy" and "neutral buoyancy;" expanded knowledge of the engineering process and most particularly the need for a planning and designing step.

Overall, the *SeaPerch* episode with the associated online game accomplished its goals of engaging tween girls, increasing interest in robotics, raising career awareness, and improving their science and engineering knowledge.

RELATED FINDINGS

In a previous post-only evaluation,² 87 fifth graders viewed at home three *SciGirls* episodes from Season Two, including the *SeaPerch* episode without the Naval Academy visit and career discussion. The interview responses of the viewers were examined for references specific to the *SeaPerch* episode and the associated *Aquabot* game and are summarized in this Appendix. The results, to the extent that *SeaPerch* was singled out in girls' responses, replicate the findings of the pre-post study in the main report.

What was surprising about the episode. After viewing the three episodes, viewers who mentioned *SeaPerch* were surprised that the girls could make the underwater robot; for example:

How much the kids can do, like make the robot and stuff, and do all the experiments.

How they made the aquabot and how they got the information.

I was surprised they could make this machine this robot thing that could go under and see the coral.

They actually made a robot.

Learning from the episode. When asked what they learned from the three episodes, 36% of the viewers specifically mentioned the *SeaPerch*, focusing mostly on the engineering of how to build and test a robot but also learning from the oyster reef experiment; for example:

I learned about making the robots for underwater, and you have to try more than once to get a good product. It was interesting to learn that they all could work, and how it would act differently if there was no current and move around if there was. It was cool.

It showed me different techniques on how I can build stuff, and if something doesn't work you might only have to change a little thing to make it work. On the show, they just had to change the tubes and the float thingies, and that shows that a little thing might make a big difference.

I learned how they kept testing things out and how they put it together.

I learned how hard it is to get the right weight for the robot to go to be in the middle.

I had not known that oysters filter the water. I liked how they built the little scuba diver camera and how they had to take off the floats because of the pressure in the water. I thought it was pretty cool. It was fun.

I always thought that the reefs were just reefs. I didn't know that the amount of animals matters for the rest of the animals. I thought if you had a couple of the animals, then the other animals could live on that. So what I learned from that is that they have to make new reefs so that can happen.

² Flagg, B.N. (December 19, 2012). Summative evaluation of *SciGirls* season two television series and website. Multimedia Research Report No. 12-014. Available at <http://www.tpt.org/science/evaluations/>

The oysters are not really healthy. I never knew this.

That oysters die out. Baby oysters grow on the shells. That's why they put them in the ocean, so more little oysters could get on them, and they could keep them going in the ocean. I thought that really taught me something new that I would like to study.

And finally, one viewer – from Florida – motivated by the show and reported *trying the buoyancy thing in the pool. I got a water bottle and made it actually buoyant.*

Aquabot game. In this study, participants were required to play a different game online, but about one-quarter of the girls also played the *Aquabot* game associated with the *SeaPerch* episode. Players enjoyed making the ROV, testing its buoyancy as was shown in the episode, and then using the ROV to locate Jake's ring; for example:

I did Aquabot. I really liked the aquabot game on the website. It rocked.

It was kind of a cool game.

My favorite game was making the aquabot and testing it. The first time, I had to try five times or so, but then a couple more times, I got the hang of it. And I was finding the ring. And the second level, I had trouble, because it was a really big space to try to find it.

I had to build this thing. It has to be in the middle to see if it works or did not work because if it went all the way down, it would be negative. You had to make the aquabot so it was the right buoyancy and test it out, and go underwater and get fish and pearls.

I learned that for the aquabot, you don't want it to totally sink, but you don't want it to float. When I did the game, you had to use what you learned in the show to add materials or take them away.

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