



Developing Effective Life Skills for Latino Student Success: A 4-H Science Project

Sonia G. Morales Osegueda

Washington State University Extension

Abstract

As science and technology play an increasingly significant role in shaping the direction of the global landscape, it's important to develop and engage young minds that will eventually lead these industries. America lacks a strong representation of students graduating with science, technology, engineering and mathematics (STEM) degrees in relation to other countries around the globe, which could eventually decrease its competitive advantage as a large global entity. Within this deficient presence of American students lies other layers of poor representation, such as from females and minorities like Hispanic-Americans and African-Americans.

Engaging students in STEM fields can prove to be a difficult challenge, however universities around the country are experimenting with options to increase interest among young students, particularly from these minorities. Ohio State University Extension designed the "4-H Eco-Bot Challenge Experiment" which introduced youth to robotic engineering concepts. The competition presented participants with the problem of programming a robot to clean up a simulated environmental spill. Washington State University modified the challenge to ensure that Latino youth across the country could participate, with results that indicated that many students were interested in STEM after being exposed to scientific problem-solving.

By developing and implementing STEM projects for Latino urban youth, 4-H Youth Development has demonstrated its capacity to deliver educational opportunities that will enrich the education of youth and expand the program's impact on Latino audiences.

Keywords: 4-H, Latino youth, STEM projects, youth development, Eco-Bot challenge

Introduction

Hispanics were the fastest-growing demographic group in the past decade in Washington State, and King County ranks second of 39 counties in ethnic diversity. A variety of factors, including the combination of high levels of immigration and immigrant birth rates, partly explain the brisk growth and the impact that is often first seen in the classroom. Recognizing how critical it is to engage Latino youth, 4-H Youth Development has designed programs with the necessary tools to enhance communication with youth to provide them with the best chance to succeed in life. 4-H offers Latino students the opportunity to participate in programs, such as out-of-school enrichment, that meet the needs of urban youth. These programs not only support skills development but also help learning in the field of science, technology, engineering and mathematics (STEM). The WSU 4-H STEM program has demonstrated its efficacy as an out-of-school enrichment program that benefits urban youth by engaging them in STEM fields.

Review of Literature

America faces a future of intense global competition with a startling shortage of scientists (NAS, 2007; Liu, 2009; 4-H Youth Development, 2012; TSU, 2012). Science, technology, engineering and mathematics (STEM) careers are essential for America's future prosperity. However, our nation is not graduating STEM majors at the rate needed to meet national needs. In fact, only 18 percent of U.S. high school seniors are proficient in science (Grigg, Lauko, & Brockway, 2006; Holcomb, 2013) and a mere 5 percent of current U.S. college graduates earn science, engineering, or technology degrees compared to 66 percent in Japan and 59 percent in China.

The College Board (2011) reported that African-American, American Indian/Alaska Native, Hispanic and female students in the U.S. are less likely to study math and science in college or pursue related careers than their counterparts. In part, this is because these students are not exposed to adequate

advanced classes in the STEM disciplines during high school and earlier years of education. Therefore, combining formal school experiences, informal experiences, and non-formal science experiences such as 4-H, Boy and Girl Scouts programs can help address the need to improve scientific literacy among K-12 youth in the United States (Carlson & Maxa, 1997; Smith & Schmitt-McQuitty, 2013). Furthermore, building collaborative and effective partnerships among schools, after school organizations, parents, volunteer leaders, and community partners with STEM expertise will enhance the availability of STEM learning opportunities to all students.

The 4-H and other youth programs have long facilitated an experiential "learn by doing" model that needs to be continually encouraged because it has been shown to increase youth's retention in secondary school (Novak & Gowing, 1984; Novak, 2010). In addition, participation in positive youth development programs increases the opportunity for students and adults to work together and build the next generation of STEM scientists successfully (Heck, 2009; TSU, 2012).

To provide opportunities to young people to pursue science careers and to enhance the nation's contribution to the sciences, in 2012, the Ohio State University Extension designed the "4-H Eco-Bot Challenge Experiment" which introduced youth to robotic engineering concepts. Youth programmed a robot to clean up a simulated environmental spill. Millions of young people across the nation became scientists during the fifth annual 4-H National Youth Science Day (Walter & Nam, 2012; Cazares, 2013; Hendrick, 2013). Participants throughout the country reported positive results in engaging youth, supporting their self-esteem, and showing how they can be scientists now and as a potential career. For instance, twelve youth from Swain County, North Carolina, gathered to assemble their own Eco-Bots and surface controls to manage a simulated environmental toxic spill. Vaughn (2012) stated that youth were able to test the interaction between their Eco-Bot design features and various surface control configurations,

and were able to determine the most effective clean-up solution. In another extension effort, more than 70 students from Smithson-Craighead Academy participated in Tennessee State University's fifth annual 4-H National Youth Science Day in 2012. The fifth and sixth grade students were challenged to design and build a robot that would be to clean up a toxic spill. Results showed that students built self-esteem and learned that they can be scientists. Lastly, in Buckingham County, Virginia, youth built Eco-Bots and control surfaces that would be effective in containing the spill. The experiment was a success, but the bigger impact was engaging youth to use their creativity (Hendrick, 2013).

Objectives

1. Engage Latino youth in STEM projects and increase awareness through hands on experiment using "Eco-Bot Challenge Project."
2. Latino youth learn how a robot can be controlled in order to solve environmental problems.
3. Latino youth evaluate Eco-Bot effectiveness in cleanup oil spill using Life Skill Evaluation System.

Methodology

During the fall of 2012, a total of 43 Latino youth ages 9-14 participated in the Eco-Bot Challenge project in two locations. In Renton, there were four parent volunteers that worked with 23 youth. At Olympic View Elementary Federal Way, ten parent volunteers received a training prior to engaging 20 youth to participate in the Eco-Bot Challenge project.

Youth built a mini robot to clean up a simulated environmental oil spill. Using straws and paper cups, the youth maneuvered a robot made from a toothbrush head, 10 mm pager motor, a small button cell watch battery and foam mounting tape. Youth were able to test the interaction between their Eco-Bot design features and various surface controls to determine the most effective clean-up solution. In addition, the Life Skills Evaluation System (Deen, Bailey, & Parker, 2004; Iowa State University, 2013)

was used via a pre-test and post-test to assess participants' changes in decision-making, communication, accepting differences, leadership, and self-responsibility skills.

Results/Discussion

Youths perceived gains in various life skills from participating in the Eco-Bot project. A significant impact on students was based on the Life Skills evaluation that demonstrated gains from pre-test to post-test. All indicators demonstrated an increase in life skills, as response frequencies shifted from lower responses to the higher responses of "usually" and "yes." For instance, on the decision making indicator, "thinking of my choices before making a decision", youth changed their response from "no" (74%) initially, to "usually" (37%) and "yes" (37%) preferences at post-test. Similarly, youth increased their communication skills, with a greater number affirming the "listen carefully to what others say" indicator after their participation in the project. Likewise, in the leadership skill, youth made gains in affirming the "I get others to share in leadership" indicator. In the self-responsibility skill, youth also made gains in this indicator that gauges youth taking care of themselves and being accountable for their behavior. Finally, the change from pre-test to post-test in the skill of "accepting differences" shows the greatest increase (63%) in the "yes" response.

These gains between the pre-test and post-test indicate that youth learned science while learning life skills. They gained skills and knowledge about the importance of participating in STEM projects. One parent reported, "Most students mentioned that they felt that they can be a scientist."

The project also was successful at engaging parents as volunteers in youth development activities. Parent volunteers at Olympic View Elementary said the activity was a unique opportunity to learn and be engaged in their children's educational activities. This outcome is congruent with Morales (2012), which stated that parents enjoy activities in which they feel comfortable while they are volunteering to support their children and their school. In this proj-

ect, parents mentioned that they will continue participating and sharing their knowledge and experience to benefit their children as well as others in the after school program where they volunteer twice a month.

Conclusions

The Eco-Bot Challenge was an introduction to STEM activities, designed to help youth discover a passion for science, technology, engineering, and math. By simulating an environmental spill, students learned how a robot works. Moreover, they learned how technology can be used to preserve and protect the environment. This hands-on activity encouraged Latino youth to be involved in STEM projects and could help spark their interest in science careers in the future.

One concrete outcome has been the evaluation of life skills which many children may not see modeled in their daily lives, such as effective communication and decision making that “are important life skills that everyone needs to survive (Brake, 2012).” They learned to share leadership roles, to accept others with respect, and to be more responsible for task completion. Finally, the project also proved to be successful at engaging Latino parent volunteers.

By developing and implementing STEM projects for Latino urban youth, 4-H Youth Development at WSU Extension has demonstrated its capacity to deliver educational opportunities that will enrich the education of youth and expand the University’s impact on Latino audiences.

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