

HOW MY FULBRIGHT AWARD ENABLED ME TO IMPROVE SCIENCE, TECHNOLOGY, ENGINEERING, AND MATHEMATICS (STEM) EDUCATION IN HONDURAS

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ABSTRACT

In the summer of 2022, I led the first Lego workshop to take place in a Garifuna community in Honduras. The Garifunas are Black-Indigenous people who live in the Caribbean coast of Central America. By planning and executing the first Lego workshop in this context, I aimed to give back to my community and expose children to creative and fun ways of learning that spur them to pursue STEM disciplines.

Keywords: Honduras • Garifuna • Lego blocks • STEM education



I am a mathematics educator, teaching assistant, and doctoral candidate in the Mathematics and Science Education doctoral program at Washington State University (WSU). My research uses equity-based teaching strategies to support students from historically underrepresented groups acquire sociopolitical knowledge, a sense of independence, and a positive social and cultural identity. Having the chance to study in different academic settings, helps me to contribute with diverse viewpoints to investigations and projects about education. I came to the United States under a Fulbright LASPAU Scholarship. One of the main reasons why I applied to Fulbright was because I shared its conviction that education is the key to promoting positive change in countries around the world through academic exchange.

The idea of a Lego workshop for Garifuna children in Honduras started in the spring of 2021. One afternoon, I was walking from campus to my apartment when I found two boxes of discarded plastic construction toys, Lego blocks. Evidently, someone had left the boxes with Legos next to the dumpster. The boxes contained approximately 3,000 blocks from multiple sets that were all jumbled together. When I saw them, I thought, “Wow! I know school kids in Honduras would love to have these Lego sets.” I knew that many children in my community had never played with Legos because they’re too pricey—the reason why many students from underserved groups or low socio-economic backgrounds have no access to them. It was then that

the dream of a Lego workshop was born. I carried the boxes of Lego blocks up to my apartment and cleaned them so that they would be ready for the next time I traveled to Honduras. Almost a year later, in the summer of 2022, I returned to Honduras to visit my family and to launch the Lego workshop.

I am part of the Black Indigenous ethnic group called the Garifuna. The Garifunas is a representative ethnic group of the country's folklore and culture. Being a teacher educator gives me the perspective to look at educational issues through different lenses. I know that it is important for teachers, students, and parents to have access to innovative ways of approaching and solving problems. STEM education provides a venue to achieve this goal. I exchanged knowledge with members of the community to execute a Lego workshop that would be meaningful for students in a way that will elicit their creativity and imagination. The implementation of the project for advancing STEM disciplines sought to contribute to developing skills now needed by the changing global environment and society in which we live. Thus, innovation was the project's driving force. Fulbright has been a life-changing experience for me and its impact is now also seen in Honduran Black-Indigenous communities.

LEARNING ABOUT STEM EDUCATION

When I started the PhD program at WSU, I did not know much about STEM education. I remembered knowing what the acronym stood for but not understanding it as a discipline. Given that my doctoral program is in Mathematics and Science education (two of the STEM disciplines), I have a better understanding of how it is studied and put into practice. Making designs with Lego blocks is part of the engineering piece of STEM. These Lego blocks can help children better picture two basic principles of engineering: static and dynamic loading. Static loading includes the weight and pressure on the structure while it's stationary, while dynamic loading refers to how outside forces act on the structure while it's being used. Lego robotics elicits students critical thinking, creativity, and problem-solving skills. Thus, it lets kids explore STEM in a fun, hands-on way.

Community projects are one of my passions. I love collaborating with people from the community to learn about their interests. Even though I am Garifuna, I did not grow up in a Garifuna town, and I do not speak the language fluently. Therefore, one of the biggest motivations for completing this project was the cultural exchange I would have with my own people after being abroad. When completing the first year in my doctorate program, I often wondered how I could combine the theories I was learning with practical actions in educational settings. I realized that creativity is important when it is made visible to others. Learning about STEM education and knowing it is not common in my country made me look for ways to plan and

enact the first LEGO workshop as a community-based pilot study. Although neither teachers nor students from the school had used Lego blocks before, creativity allowed them to find alternative ways to create ideas for their first Lego designs.

THE LEGO PROJECT

The project was executed in Cusuna, a Garifuna community with 2,000 inhabitants. Cusuna is a special place for me not only because it is where my father was born and raised but because it holds many family and childhood memories. There is a sentimental bond to the school because it is where my father first went to school in the early 1950s when it was founded. To build rapport with the school authorities, I first met with the principal and teachers to share ideas about the workshop. There were not enough Lego blocks to have all students participate, so the teachers decided to select students from 4th, 5th, and 6th grades and make the workshop a competition. We met twice before the activity and came up with a plan. Homeroom teachers selected four students per grade, and the workshop was conducted with twelve students. Three community leaders were chosen as judges to listen to students' presentation of their design and select the winners (1st, 2nd and 3rd places). The judges were one teacher and two young community leaders who are well-known for their skills in technology and innovation. This all helped to connect the learning from the workshop to the community.

The workshop took place over three days in an afterschool schedule (2.5 hours/day – 7.5 hours in total). From the participants, only one had had experience working or playing with Lego blocks. For the rest of the group, it was their first experience building Lego blocks. The guidelines were open-ended. I told them to work in groups and create the best design they imagined with the available pieces. As mentioned above, some of the Lego sets were not complete; therefore, students needed to be creative to come up with designs.

The school principal accompanied me on the first day. Students were curious about what they were going to do. They saw it as a game at first, but after a couple of hours, they were fully engaged and working collaboratively. The teacher said seeing them working so quietly and calmly was hard. When they were called to stop their design for the day, they wanted to continue working. Day 2 was nothing short of excitement and eagerness to work with Lego blocks. All the students were on time. I have to confess some of them were in the place already waiting for me before the time we had set to meet. They were too excited to start working and did not want to waste time. Another group knocked on the door at my house to see if I was on my way already. They were certainly engaged and excited. Many objects they created were familiar to them, but others were not. Some were building parks, cities, houses, cars, etc. Others were building satellites and objects for space launches. Certainly, building designs with Lego blocks boosted their creativity. I was thrilled to see the children getting inspired and enjoying the process. Again, at the end of the activity, they wanted to stay longer, and on

their way home, they talked about their projects. Finally, on the third day, the community leader came to meet the contestants and the winners. The three first places were given to those students who created original designs. They also were asked to explain what they created. Although they worked in groups to make the designs, the judges chose the winners individually.

BIGGEST TAKEAWAYS

Through this activity, I aimed to encourage the development of programs and contests that inculcate in Honduran children a passion for studying science, technology, engineering, and math. Also, the activity helped teachers see the power of STEM education and how they can do these activities at school by engaging students in such meaningful work. This activity helped build bridges between Honduras and the United States. Since returning to the States, I have been a guest speaker in various schools in Washington State, where they want to learn more about students in Honduras and how the project was developed. The video added in the notes section of this article presents the joy and enthusiasm of students, which is certainly contagious to other kids who have seen the video in the US

Something that stood out to me was the kids' interaction in their home language. Although Spanish is the first language in Honduras, children speak mostly Garifuna. Cusuna is one of the communities where people still speak their native language. Children are fully bilingual in Spanish and Garifuna and during the activity they communicated fluently among the group members to make the best decisions for their designs. Furthermore, children were discussing ways to create designs of organic ways to generate electricity, given that they live in a community that lacks access to this service. Through this project, students learned to develop important problem-solving and collaboration skills that will support them in applying their knowledge to solve local issues in the future.

Given that this was a pilot study, I wanted to see a small-scale Lego project as the first approach to STEM education in the community. Even though it was a positive activity for all, there were some challenges. For instance, some students evaded working in groups. Some students mentioned they were not used to working in groups. Therefore, there was discussion about who owned the pieces and what they wanted to build with them. On the other hand, some parents considered the activity a game and did not let their children participate in the activity over all three days and so some students only attended one or two days. These challenges were not a reason to stop the initiative; on the contrary, the challenges provided better ideas to navigate the process. For instance, when parents went to pick up their kids, I talked to them and explained what Lego blocks are and why they are important in children learning. I also invited members of the community to see the students' designs. A key result of the project is not only the impact the activity

had on children, but on the larger community as well. The Lego blocks were donated to the school after the activity. In that way, other students who did not participate in the workshop could also have the opportunity to build with Lego blocks.

FOLLOW-UP AND FINAL REMARKS

After the pandemic hit, I noticed many possibilities of global connection to communicate with people abroad through online platforms. Although, I came back to the United States to complete my academic program, I continue in communication with teachers and students in Cusuna. I have shared a video, photos, and ideas about the project with colleagues and mentors at WSU. Two of my colleagues are Lego robotics coaches, and they have provided me with new resources to be better informed on the project. In Honduras, I am in contact with the Honduran STEM foundation, and I have become a STEM education ambassador for ethnic groups and minorities in the foundation (Honduras STEM foundation, 2023).

Currently, my commitment is to be an agent of change and incorporate cultural and academic aspects in all of my activities. I aim to become a true member of a research community that promotes equity, access, and inclusion. The Lego project and future projects will align with Fulbright's mission to create academic exchange programs for the advancement of STEM education in Latin American countries.

Being a Fulbright grantee is a profound experience that remains alive. During the workshop my commitment to creating impactful societal activities became stronger. Now I am a Fulbright alumnus for life, and the impact of that experience will enrich my contributions as an educator for the rest of my career. Through my work, girls in my community now know that they can study mathematics, science, engineering, or anything they set their minds to do. It is an honor to be a role model for them. Thanks to the Fulbright program people from ethnic and underserved groups are benefiting from innovative educational approaches. I envision more Lego robotic competition and STEM workshops in Black and Indigenous communities. The Fulbright program provides a unique opportunity for educators to broaden their knowledge and skills, and to deepen their commitment to promoting education as a means of social and economic development. I am grateful for the support and guidance received through the Fulbright program, and I remain committed to applying the knowledge and skills that I gained to make a positive difference in Honduran children and in the field of education more broadly.

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NOTES

1. Honduras STEM Foundation. (2023, February 3). *¿Qué son las Habilidades STEM?* [What are STEM abilities?]. Retrieved From the Honduras STEM Foundation website: <https://hondurasstemfoundation.org/stem>
2. LEGO Education. (2020, May 10). *Pre-engineering program. A LEGO Education Program: Introductory Simple Machines Program.* <https://education.lego.com>
3. Thomas Zapata, Johana. (2022, September 1). *Lego workshop in a Garifuna community - Taller de LEGO con niños garifunas.* Youtube. Educational video, 7:12. <https://www.youtube.com/watch?v=6Rs4Z18AhZ8>



Johana with a group of Garifuna children during the Lego workshop in Cusuna, Honduras.

BIOGRAPHY

Johana is a mathematics educator from Honduras. She is a Graduate candidate in the Mathematics & Science Education Doctorate Program at Washington State University. Prior to beginning her doctoral studies, Johana pursued a B.Ed. in Mathematics in Honduras and continued her graduate studies in Ireland, with a master's in applied mathematics. Johana's research interests focus on three areas (1) teacher education and professional development, (2) mathematical modeling, and (3) language and culture in mathematics. In 2022, she completed the second year of her doctoral program under a Fulbright LASPAU scholarship (2020-2022). Johana can be reached at johana.thomaszapata@wsu.edu or jthomzap@gmail.com