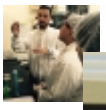
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# Ana Helvia Quintero: A Borinqueña that has re-invented math education [1]

Submitted by Luis Enrique Valentín Alvarado [2] on 5 November 2015 - 5:21pm



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In November 2013 we launched our Borinqueña [4] initiative to broaden the discussion about women in science, technology, engineering and mathematics, and promote the participation of women in these disciplines and careers where they have traditionally been underrepresented. On our second Borinqueña [4] anniversary, we dedicate our monthly story to Dr. Ana Helvia Quintero, a math loving Borinqueña, educator by vocation and profession that has fought (as a professor, researcher and within the sphere of public policy) so that our young people have access to the world of mathematics.

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Ana Helvia Quintero was born, raised and educated in San Juan. Her love for mathematics shaped the beginnings of her scholar career. However, studying mathematics was not her main goal, instead she dreamed of becoming an educator.

During her junior year at the University of Puerto Rico High School [5], Ana Helvia was invited to take a pre-calculus pilot course offered by the renowned professor Eugene Francis. It was this great teacher that sparked her desire to continue a career in mathematics. She completed her

bachelor's degree in mathematics and philosophy at the University of Puerto Rico at Río Piedras [6] and later continued graduate studies in pure mathematics at the University of California Berkeley [7].



***Dr. Quintero at an odontology summer camp at the University of Puerto Rico Medical Sciences Campus. Photo courtesy of Ana Helvia Quintero.***

After obtaining her master's degree, but before finishing her doctorate, Ana Helvia returned to Puerto Rico to work as a college professor. This experience opened her eyes, and made recognize that mathematics were a challenge for her students; many of the students that came to the university had serious deficiencies in math skills they should have learned in high school. It was then that Dr. Quintero decided to change focus and pursue her doctoral studies in education and math learning. In this way of she could contribute her part to improve math education in Puerto Rico.

Ana Helvia enrolled at Massachusetts Institute of Technology (MIT) [8], where she found a suitable doctorate program that allowed her to design a curriculum tailored to her educational objectives. Since MIT did not have an Education Department at the time, Ana Helvia and her mentors created an interdisciplinary course program to fit her needs, where she joined the Division for Study and Research in Education. This group was diverse in terms of professional specialties but was united by their same interest in education and didactic in different disciplines. In her doctoral dissertation, entitled "Children's Understanding of Intensive Quantity", she studied how fourth to sixth graders solved different multiplication problems. After solving the problems given, the children were interviewed to understand how they found the solution. With her research, Ana Helvia concluded that multiplication problems have different structures that provide various levels of difficulty for the students.

After completing her doctorate, Dr. Quintero set to work and has not stopped for the 42 years she has been a professor in the Department of Mathematics at the University of Puerto Rico at Río Piedras.

**Practicing what you teach**

Throughout the years, Dr. Quintero has been guided by her interest of improving the educational opportunities of her students, especially for those from low-income backgrounds. For this reason, along the years she has established multiple collaborations to aid her search of finding different ways to encourage education.

One of these collaborations is the Regional Training Center for Mathematical Investigation (CRAIM) spearheaded by Dr. Jorge López. The goal of the center's programs is to help students understand math in context, underlining the fact every day we face questions and situations that require math skills. According to Dr. Quintero: "I believe that the main problem in mathematics is that it is taught in a mechanical way. Students may be able to do math problems by substituting and finding the right number, but that number does not mean anything to them. For example, most students see the meaning of math when it is related to their area of study. In our CRAIM program one of the things we have tried to adopt is to teach realistic math, a math with context. This means that we present the student with a mathematical problem for which he/she has a need to develop a formula and use it. Thus the formula arises from a need and not a definition." The CRAIM team has designed a math curriculum with context in collaboration with teams from the University of Wisconsin-Madison [9], the University of Barcelona [10] in Bellaterra and the University of Utrecht [11] in Holland. The Department of Education in Puerto Rico [12] has adopted elements of this curriculum.

Currently, the members of CRAIM, including Dr. Quintero are working on a book entitled "The Numerical Sense: more than numbers", that has the purpose of helping students better understand math. Dr. Quintero also wrote a book entitled "Mathematics with sense". The purpose of her book is to serve as guide to educators to teach math. This book, with additional contributions by Dr. Héctor Rosario, a professor of the same training center, will soon be published in English.

Another collaboration that has positively impacted Puerto Rico's education is an integrated teaching curriculum for K-6. The principal objective of this curriculum is to combine topics of interest with reading and writing skils as well as with other academic requirements during class discussions.

For Ana Helvia, the learning difficulties that students face and the little interest for some subjects like math, arise from a lack of motivation. Dr. Quintero told us: "I remember once when I was doing research in a school and the teacher approached me and said: I do not know how students want to go to your class because mathematics are so boring. So if teachers think that way, what can we expect from our students?" This is why Ana has devoted her life to the modernize math education at educational institutions in Puerto Rico. To this end, she developed a mathematics course manual for future elementary and high school teachers.




***Dr. Quintero offering a workshop to teachers. Photo courtesy of Dra. Ana Helvia Quintero.***

Another project that Ana Helvia has been working on is the program "Access to Success [13]", funded by the United States Department of Education, which encourages students to pursue college degrees. About to this program, Ana Helvia tells us: "We have created summer camps, math clubs and a series of online courses for high school students. Through the Access to Success platform students can improve their academic performance in mathematics, and prepare to take Puerto Rico's university admission test, the College Board, so that avoid taking remedial courses after starting college."

More recently the Access to Success [13] program has been developing an electronic portal with practical information to help students "survive" high school and the transition to the University of Puerto Rico. "The last thing we have developed is a portal called "Between students" specially designed for high school and college freshmen, in which students can ask questions like: Where can I live? Where can I eat? Where can I go study after the library closes? These and other questions may not be answered by a professional counselor but yes by another student", emphasizes Dr. Quintero.

Ana Helvia has held various administrative positions in the Department of Education and the University of Puerto Rico with the goal of improving education and making accessible to every student. Ana Helvia was Subsecretary of Student Affairs in the Department of Education, Director of the Center for Educational Research and Innovation of the General Council of Education, Vice

President of Student Affairs at the University of Puerto Rico and Director of a summer program for high school students sponsored by the National Institutes of Health (NIH) [14].

Her passion for mathematics and education has led her to re-invent the teaching of this subject. For Ana Helvia, her work is very enriching. The two things that she enjoys most are teaching and work on projects to improve teaching so that it is transformed into teaching with context. For this reason she supported the change of the school Antonio S. Pedreira in Puerto Nuevo from a traditional one to a school of integrated development. At this school the curriculum starts from the students' interests and different subjects are introduced thereafter. "Seeing these changes is what fills with the most satisfaction", Ana Helvia asserts.

To the new generations of Puerto Rican scientists Ana Helvia advices: "Find the emerging areas in the different science disciplines, follow your dreams and what you are truly passionate about".

Definitely Dr. Quintero is a successful Borinqueña and a prominent figure in the education of Puerto Rico. Her professional and academic contributions inspire the new generations of educators, academics and math teachers. To Borinqueñas like you, we say thank you!

If you would like to learn more about Dr. Quintero visit her profile [15].

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