

## **Mathematics through radio, podcasts and a blog**

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### **Abstract**

For three years a group of professors from the public universities in Costa Rica and science communicators from CIENTEC have joined forces to communicate brief messages about mathematics, from a very broad perspective, to general audiences. Matex1minuto is the name of this one minute program that is broadcast through the university radio station and also published on the internet as a podcast within a blog ([matex1minuto.blogspot.com](http://matex1minuto.blogspot.com)). This group shares a long history of working for the

improvement of mathematics education through a biennial Teacher Conference (the International Math Festival) since 1998 in Costa Rica.

Though the beginning was difficult, because the radio station did not consider mathematics as an interesting topic, through time and interdisciplinary work, the support has grown. Benefits of the program include the broadening of the professors' communication skills beyond formal means to a radio format. The international Spanish speaking community has taken advantage of these Spanish resources on the internet. The podcasts are also being re-broadcast in Chile. Educators have found the podcasts very useful in introducing math topics in their classes. Many positive comments have been received from listeners from many countries.

### **Introduction**

Starting in 1998, the Costa Rican Public Universities – Instituto Tecnológico de Costa Rica, Universidad Nacional, Universidad Estatal a Distancia and Universidad de Costa Rica – joined efforts with CIENTEC, a local Science Foundation for the promotion of Science and Technology, to organize a major Math Teacher Conference movement targeting K-12 educators, university researchers on pedagogy and other key providers of educational programs.

Since its inception, the conference, named “International Math Festival”, was conceived and designed not only to support the curricular needs of the local Education System and its educators, but also to bring together innovative and engaging projects and ideas that facilitate the increasing of numeracy in the general population. Bringing math into the culture of the community and linking it with other fields is a fundamental goal of the biennial program.

From this long standing formal education initiative, and from CIENTEC's science communication experiences in radio and podcasts, grew a proposal for a ‘Math for a minute podcast’. Each topic is broadcast by the local university radio station, Radio U 101.9FM, simultaneously shared through an internet blog, and more widely broadcast via other radio stations in Spanish speaking countries.

The program has also received scripts contributed from colleagues in the United States and Mexico.

## **Methodology**

It is not simple to write short meaningful scripts that communicate: the connection and relevance of mathematics to everyday life; the way that math advances as a human development; math as a living science, not only as a language for other sciences; and the need to address misconceptions or illustrate non intuitive concepts. To verbally present short mathematical stories without using the usual physical props or formulas requires much mastery. In addition, it is necessary to take into account a well documented fear of mathematics throughout the world that hinders broader lifelong learning and even affects career choice (Marín, G., Barrante, G & Chavarría, S. 2008).

‘Math for one minute’ was the title given to this program after much negotiation with Radio U and a working group already involved in the organizing of the International Math Festival. At first, Radio U found it difficult to find radio production staff who were interested enough to collaborate with this project.

Each podcast is aimed at providing a ‘bite-sized’ concept to place a seed in the mind of listeners for them to think about during the day. Initially, the scripts were limited to about 160 words, requiring a new language of math story telling to be developed, which avoided the use of formulas.

Across the topics, both women and men and different cultures are portrayed as contributors in the field, to illustrate that math is part of a broad human and social endeavor.

The challenge of the short program format has forced the working group to rethink approaches to topics and the use of terms, formulas, big numbers, etc. The long term investment in this public communication project has been beneficial to the University Professors participating, growing their skill and competency in story telling, adapting the mathematics lingo spoken inside the field to a language appropriate for use in communicating to a broader audience through the radio and internet.

Most scripts for the programs have been produced outside of working hours, in regular meetings where the informal setting provides a creative environment to draft, review and enrich the final scripts. The scripts are then passed on to the communicators in the Radio Station where the recording is produced and incorporated into the broadcasting plan. Finally, the broadcasted topic becomes a podcast in MP3 format

enabling the radio broadcast to be published on the internet, providing free access by individuals and other radios stations in the Spanish speaking world.

This initiative started in 2010, when the ‘Math for a minute’ podcasts were approved by the University Radio System (University of Costa Rica). Radio Universidad (96.7 FM) provided the recording and the programming support to air them during weekdays. The programs have been simultaneously posted by CIENTEC in a blog (<http://matex1minuto.blogspot.com>) and, since 2014, in CIENTEC’s renovated website (<http://www.cientec.or.cr/areas/comunicacion>).

### **Evaluation and improvements**

An evaluation in mid 2013 by colleagues from the Dirección General de Divulgación de la Ciencia in the Autonomous National University, UNAM, in Mexico suggested some improvements to the podcast. This included increasing the number of words in a script from 170 to about 210 words, and reducing the detail in the pre-recorded introduction to the broadcast. These changes were accepted and welcomed by both the radio station and the production groups.

As a result, the introduction to each topic now only says “Math for a minute, stories of mathematics”. The slightly extended broadcasting time for each topic has enabled the inclusion of about 30 more words to better close ideas or connect the topic to further mathematical ideas.

### **Outreach through presentations and the internet**

‘Math for a minute’ has been presented in various national conferences (2010-2012 in San Jose, 2013 in Liberia and Zacatecas, Mexico) on formal education for general teachers, math teachers and science teachers, encouraging them to share the program in their classrooms and communities. In 2013, the initiative was presented at an international conference in the Latin American Network for the Popularization of Science and Technology, RedPOP, in Mexico for science communicators and journalists. Their feedback has been very positive. It is encouraging to learn of the podcasts being broadcast in other countries through their science communication programs, for example by Mundociencia in Chile.

Until December 2013, the ‘Math for a minute’ Blog was the only site used to publish the podcasts. Since January 2014, the podcasts are published firstly in CIENTEC’s renovated site with a link from the original Blog (<http://matex1minuto.blogspot.com>).

Since 2010, the blog has received 24,849 visits. In March 2014, the country of origin of visits in decreasing order of total number of visits was Costa Rica, United States of America, Mexico, Chile, Colombia, Spain, France and others. It is interesting to note that the United States is in second place for number of blog accesses, but this is perhaps not surprising since the United States is experiencing significant growth in its Spanish speaking population.

### **An outreach project is approved**

Another spin-off outcomes of the program is the support of a new major initiative involving a partnership between the Universities and CIENTEC, through a special fund for university education for extension programs. Based on the International Festival and the Math for a minute programs, the working group presented a proposal in 2013 to the Council of Deans of the Universities, CONARE, to fund a collaborative project in support of: increasing opportunities to engage the general public in the International Festival; continuing the ‘Math for a minute’ programs on radio and in podcasts; and developing a Traveling Museum of Science and Technology. This proposal was approved for implementation in 2014 and 2015, and the three project elements are now in development.

### **Objectives and examples of Math for a minute programs**

The team that produces ‘Math for a minute’ set out the following objectives to this science communication strategy:

To facilitate playful ideas linked to math. To present math as an active discipline, like other natural sciences, where new knowledge is created. To relate math to everyday life. To connect math with other disciplines. To show aspects of math history and their relationship to other cultures. To present a diversity of areas and people who work in mathematics (specially women). To support learning of

different concepts like exponential growth. To show the usefulness of math in problem solving. To present technology's cognitive and logic requirements. To cultivate analytical abilities. To contextualize the value of abstraction. To present the esthetic beauty and enjoyment in figuring out patterns. To present math as an accessible and social area where life long learning is possible.

By March 2014, a total of 55 podcasts had been produced and published across a variety of topics. The following examples of extracts from selected scripts, translated from Spanish to English, illustrate how topics address the program's specific objectives.

*To overcome math anxiety, you need to think like a mathematician. That is, taking the time to solve the problem and being creative with different approaches. You can make drawings or diagrams, use physical materials, use your intuition and even use trial and error approaches. With practice, your problem-solving skills will grow and the fear will diminish.* Margot Martínez, Universidad de Costa Rica  
<http://matex1minuto.blogspot.com.au/2013/03/temor-hacia-la-matematica.html>

*Suppose you flip a coin 100 times, and partway through you get seven heads in a row, or seven tails. What would you think? Seven in a row! If you're like most people, you'd think that the streak was unusual: you were incredibly lucky, or maybe the coin wasn't random.* Contributed by Tim Erickson of Eeepsmedia.com, USA.

<http://matex1minuto.blogspot.com.au/2010/05/streakiness-can-be-deceptive.html>

*Have you ever thought about coloring a map of the American Continent, so that every neighboring country has a different color?*

*You will be surprised to know that this challenge was solved with a maximum of 4 colors. The problem posted in 1852 challenged many mathematicians for more than a century. It might seem simple and absurd, but solving this problem advanced the field of Topology and Graph Theory, both of which are used in the*

*design of optimal routes. Today transportation routes, computer networks and GPS are based on this theorem.* Alberto Soto, Universidad Estatal a Distancia, UNED, Costa Rica. <http://matex1minuto.blogspot.com.au/2012/06/teoria-de-los-cuatro-colores.html>

*How much time do I need in the morning? How much food satisfies my appetite? These estimations are processed rapidly in our brain, without us taking notice of it. Estimating is different from counting. It is a different strategy to approximate a measure using intuitive information based on experience. Estimation is also very helpful in mathematics, specially when using calculators or other programs to make arithmetic calculations.* Alejandra León Castellá, CIENTEC, Costa Rica. <http://matex1minuto.blogspot.com.au/2012/03/el-valor-de-la-estimacion.html>

*The Kefren Pyramid was built more than four thousand five hundred years ago. The construction was based on the 'Sacred Egyptian Triangle' with proportions 3-4-5. Through the centuries this tradition in construction used this relationship to produce straight angles in the buildings, a task very difficult to achieve without other instruments.* Manuel Murillo and Evelyn Agüero, Instituto Tecnológico de Costa Rica <http://matex1minuto.blogspot.com.au/2012/03/el-teorema-de-pitagoras.html>

### **Evolving Science Communication in the region and Radio opportunities**

Latin American case studies by Luisa Massarani and Jessica Romo from Sci.Dev.Net confirm the regional discussion around the transformation of strategies to communicate science, where the so-called more traditional 'dissemination of science strategies' are seen as predecessors, and differ from a more modern concept of 'communication of science' which require a reconfiguration and adaptation of the information to reach different audiences and channels. That same study shows the opportunities available through radio programs to reach major populations with innovative programs in science and technology.

CIENTEC and its partners plan to continue this learning process to optimize the effectiveness of math communications and to further grow life-long opportunities to engage people in mathematics and its connections to everyday life and culture, including through radio and the ever-evolving internet.

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