To cite this article: Campos, R., & Araújo, M. (2017). Traditional Artistic Expressions in Science Communication in a Globalized World: Contributions From an Exploratory Project Developed in Northeast Brazil. *Science Communication*. First published online: July 17, 2017. DOI: 10.1177/1075547017721204

To link to this article: https://doi.org/10.1177/1075547017721204

Traditional Artistic Expressions in Science Communication in a Globalized World: Contributions From an Exploratory Project Developed in Northeast Brazil

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Abstract

Science communication projects share one main goal: to bring together academia and society. However, despite the several formats used to make this bridge, traditional artistic expressions—those that are part of the cultural identity of a group—are seldom used. These formats can be particularly relevant in a globalized world where people from different social and cultural backgrounds meet. We present a project developed in Brazil that used a traditional type of theatre and literature to engage the public in a health control program, and reflect on the potentialities of these formats to communicate science in our multicultural societies.

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Keywords
traditional artistic expressions, cultural identity, science communication, informal learning, public engagement

Diversity of Science Communicating Formats

A common goal to all science communication projects is narrowing the distance between scientists and the public, bringing both "worlds" to a dialogue with an effective channel to exchange information (Chilvers, 2013; Bucchi & Trench, 2014). Formal academic knowledge is desirably presented in an informal language, so that the public can reflect on the topics being addressed and engage in an open and rational discussion about the topics under consid-eration. Ultimately, this proximity between expert and nonexpert knowledge will lead to a more fruitful relationship between academia and citizens and thus to a more informed society.

Keeping in mind the vast differences among publics, different formats have been tested to improve the communication process in informal learning environments (see, e.g., Horst & Michael, 2011, for a short review of the different science communication formats). These formats include the use of comics (Spiegel, McQuillan, Halpin, Matuk, & Diamond, 2013; Tatalovic, 2009; Varela Amaral, Forte, Ramalho-Santos, & Girão da Cruz, 2015), music (Moreira & Massarani, 2006), games (Campos & Sá-Pinto, 2013; Sá-Pinto, Cardia & Campos, 2017), theatre (Gunderson, 2006; Moreira & Marandino, 2015; Pinto, Marçal, & Vaz, 2013), or animated videos (McGillion, 2017; Varela Amaral et al., 2015). The main objective of these resources is to promote public engagement with science through proximity and familiarity and by triggering positive emotions (Pinto et al., 2013; Sinatra, Broughton & Lombardi, 2014). However, when conducting a search on Google Scholar database using a combination of "traditional art" or "folk art" with "science communication" or related expressions (e.g., "traditional artistic expressions" or "communicating science") in English and in Portuguese, we retrieved very few papers. Brazil seems to be an exception, where some authors have used traditional art to communicate science-related contents or have analyzed scientific topics present in traditional artistic expressions (Almeida, Massarani, & Moreira, 2016; Assunção & Pinho, 2016; Moreira & Massarani, 2006; Oliveira et al., 2014). Thus, our conclusion is that even though speaking directly to one's identity, traditional artistic expression formats, which we here consider as those that are part of the cultural identity of a given group, have seldom been use to communicate science globally.

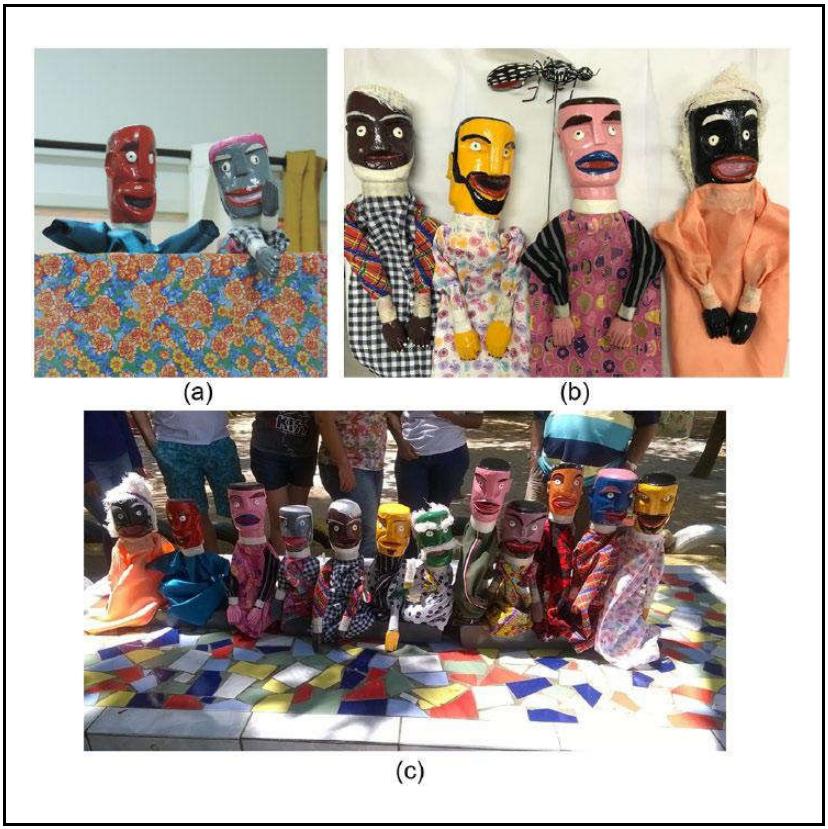

Figure 1. Wooden puppets used in *mamulengo* theatre: (a) during a presentation of "Zé and Zika" in a school, in the semiarid region of northeast Brazil; (b) part of the characters from the "Zé and Zika" play, including a representation of an *Aedes* species mosquito used during the presentation; (c) the "cast" and their creators and interpreters.

Here we discuss an exploratory science communication project developed in northeast Brazil that incorporates two formats of Brazilian traditional artis-tic expressions to engage the public in questions related to biodiversity and public health: *mamulengo* theatre and *cordel* literature. Mamulengo theatre is a Brazilian form of puppet theatre characterized by the use of wooden pup-pets dressed in colorful textiles (Figure 1), strident voices, a small and ambu-lant folding stage, and a narrative that traditionally portraits daily-life situations in a satiric way, calling the audience to interact with the puppets

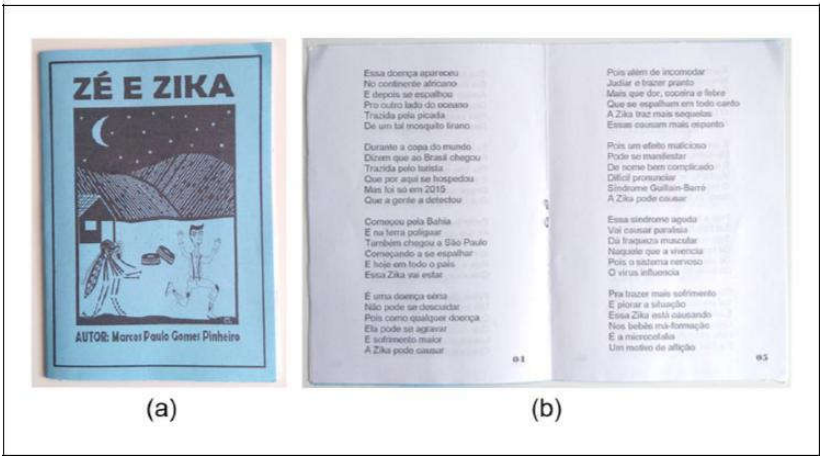

Figure 2. "Zé and Zika," an example of a *cordel*-type story developed for a science communication project: (a) the book cover is illustrated with a woodcut, a characteristic usually found in this type of literature; (b) in the right top corner, in the first two lines, we can read, "Because besides annoying, harassing and bringing tears (. . .)," an example of how science was used as a metaphor.

(Assunção & Pinho, 2016; Câmara Cascudo, 2012; Oliveira et al., 2014). This puppet theatre was presumably inspired by similar forms of European theatres, such as D. Roberto in Portugal, Guignol in France, Pulcinella in Italy, or Punch in England. It also shows similarities with traditional artistic manifestations from other parts of the globe, namely, with *Karagós* in Turkey and *Vidouchaka* in India (Câmara Cascudo, 2012; Elias de Castro, 2015). Mamulengo theatre is an interactive format usually performed in a generic venue, like a village or town square, that can be used as a vehicle for higher involvement and an invitation for "idiotic behavior" (Bultitude & Sardo, 2012; Horst & Michael, 2011; Sardo & Grand, 2016).

Cordel literature is a Brazilian form of traditional poetry that can be considered a direct descendant of the medieval European minstrelsy (Almeida et al., 2016). It has constant rhymes and accurate metrics and often uses local terms. The poetry depicts legends, myths, or stories from the oral tradition or daily situations, frequently using humor, and is printed as a small booklet or pamphlet sometimes illustrated with woodcuts (Figure 2). Cordel is the Portuguese word for string (and so "cordel literature" means literally "string literature") because the booklets were usually sold in the street markets where they were displayed hanging from a string. The history of cordel literature dates back from the Middle Ages in Europe, where similar formats can be

found in Great Britain (chapbooks; see also the NYC/CUNY Chapbook Festival for modern uses of this format: http://chapbookfestival.org/), France (*bibliothèque bleue*), Germany (*volksbuch*), and Portugal and Spain (*cordel*).

Cordel literature is usually seen as a minor form of literature, with a long tradition of being kept apart from the "academic elites." But this format is well accepted by and attractive to the public and thus offers a good opportunity to present scientific complex topics in a simple format. Moreover, its simplicity can be used to challenge the public to contribute with their own writing, sharing different point of views on the same subject. These personal texts can give scientists new raw material to develop or adapt their science communication or research project. Recently cordel literature has been used as vehicles of information, including in science communication projects (Almeida et al. 2016). For example, this form of literature has already proven to be a good communication resource for health promotion (Pagliuca, Oliveira, Rebouças, & Galvão, 2007).

Case Study: Globalization and the Spread of Infectious diseases: The Zika Virus in Brazil

Health communication can be seen as a niche within the field of science communication. Often, health communication and health promotion programs expect both to increase public health literacy and to bring about behavior change (e.g., Sørensen et al., 2012). Health literacy has impact in different levels, from the individual to community health, and assumes particular relevance in cases where behavior changes are essential to eradicate fast-spread-ing diseases, such as emergent infectious diseases. The economic development and migration rates experienced in recent decades worldwide have led to pro-found changes in climate and in ecosystems (Keesing et al., 2010), causing discontinuities between the established balance in ecological relationships and evolutionary processes. In terms of infectious diseases, these migratory movements and environmental disturbances facilitated rapid host changes and new geographical colonization by pathogens without giving the new host time to develop resistance (Hoberg & Brooks, 2015; Sala, Meyerson, & Parmesan, 2012). One of such cases is the spread of *Aedes* species mosquitoes globally and the outbreaks of infectious diseases in several parts of the globe.

Aedes mosquitoes are vectors for three diseases with a high prevalence rate in Brazil: dengue, zika, and chikungunya (Cardoso et al., 2015; Musso, Cao-Lormeau, & Gubler, 2015). All three diseases are considered global pub-lic health threats (Cardoso et al., 2015). Northeastern Brazil is an endemic region for both dengue and chikungunya, and it was also the first region where a zika outbreak was reported (Zanluca et al., 2015). Zika virus has

been known in Africa for several decades without causing any major health concerns; however, since 2007 it has spread from Africa and Asia, leading to large epidemic episodes. The spread was first reported in the Island of Yap (Federated States of Micronesia), and by the end of 2016 about 20 countries in the Americas had declared infectious outbreaks (Kindhauser, Allen, Frank, Santhana, & Dye, 2016). In Brazil, this newly reported infection probably originated through migratory movements of people between South America and the rest of the world. A similar path was observed for dengue and chikun-gunya, which also spread worldwide, closely linked with globalization move-ments (Musso et al., 2015). This scenario offers ample opportunities to create spaces for a dialogue between scientists of different fields and the communi-ties affected by the diseases. An evolutionary framework allows us to under-stand and manage the (re)emergence of infectious diseases and also to develop new methodologies of approaching disease (see Stearns, Nesse, Govindaraju, & Ellison, 2010; Vila & Campos, 2013, for some insights on evolutionary medicine). While scientists aim to trace the evolutionary route and identify, describe, and treat instances of *Aedes*-borne infections, com-munities can bring to the discussion their experiences with mosquito control actions and inform about the distribution of instances of infections.

Traditional Theatre and Literature Engaging Communities in Health Control Programs

Eliminating the access of *Aedes* mosquitoes to water can lead to successful elimination of the vector mosquitoes and thus eradicate the diseases in the affected areas (Morrison, Zielinski-Gutierrez, Scott, & Rosenberg, 2008). But this simple step is effective only if all member of the community take part in it. Consequently, well-organized science communication campaigns can play a fundamental role in promoting attitudinal changes in the popula-tion, leading to sustained mosquito control behaviors. With this in mind, and working with students from a Brazilian Federal University (Figure 1c), we set and evaluated a mamulengo theatre script and a cordel poetry narrative based on *Aedes*-borne infections (Figure 1b). The aim of the project was to stimulate a discussion with Brazilian communities in the areas affected by the *Aedes*-borne infections about the diseases associated with the mosquito, and their origin, symptoms, prevention, and treatment. These traditional artistic expressions formats take advantage of a very informal and humoristic approach to create a dialogue with the audience based on attitudinal changes toward mosquito control actions. In this sense, following the definition pro-posed by Gunderson (2006), science is used as a metaphor, as the narratives

uses a script that "combine effective science with effective poetry to create something that is true both in the concrete and the abstract." For example, the character that narrates the cordel story refers to symptoms of zika infection as if the virus is a person: "(. . .) because besides annoying, harassing and bring-ing tears (. . .)" (Figure 2b).

The text written for this particular theatre, as well as the overall performance, followed the main aspects of the mamulengo theatre described above. The cordel book on the theme was also associated with the presentation, being distributed to the public in the beginning of the play. The poetry in this booklet recreates the theatre script. It tells a story about a character, "Zé," who falls sick with zika fever and explains to a friend the symptoms he was feeling and what the doctors told him to do to prevent further complications and to control the spread of the vector mosquitoes (Figure 2b). Both narra-tives pay special attention to the attitudes one should have in order to prevent infections and help eradicate *Aedes* mosquitoes.

Scientific contents play a secondary role as the audience focus on the movements of the puppets. This is in line with the major goal of the activity: to change attitudes. The puppets thus serve as role models, and the audience express their empathy toward both the puppets and their behaviors.

Preliminary Evaluation of the Use of Traditional Artistic Expressions in Science Communication

Both mamulengo and cordel were used during a visit to a rural community in the semiarid region in Northeast of Brazil to promote a dialogue related to *Aedes* infections. In this particular session, the audience consisted of a mixed group of teachers from different scientific areas, students attending different school grades, and some local citizens, with a total of 30 participants. The audience was recruited by the local Secretary of Education, after a previous contact with the group of scientists coordinating the project. Due to the high temperature on the day of the activity, this session took place in a classroom instead of the village central square.

To have a first insight of the usefulness of these formats in public engagement and the creation of a space for open dialogue, we conducted a prelimi-nary evaluation using a direct observation methodology, where one researcher stood aside as an outside observer during the activity. We also recorded the session for further complementary analysis of the reactions of the public. This complementary analysis was made by a second researcher who evaluated the session only through the video, using the same parameters. The guidelines for the evaluation followed a list of three main parameters:

engagement, interactions, and integration. By engagement we mean the observation of how the audience related with the puppets, with the background context of the play, and with the science-related concepts. Under the parameter interactions we observed the connections established between the different members of the audience and between them and the play and concepts; nonverbal behaviors, such as facial expressions or gestures, were also observed. By integration we mean the observation of how the audience was making use of the concepts within the mamulengo and cordel narratives dur-ing the sessions (mostly by verbally expressing personal experiences or emo-tions to other members of the audience or to the puppets). Both researchers met after the independent evaluations to compare notes.

In general, the public expressed amusement throughout the performance. Preliminary results highlighted a high level of public engagement: the audience shared their own experiences with mosquito control efforts and interrupted the theatre with comments related to the script, to criticize some of the behaviors exhibited by the puppets, or to encourage the characters to take on actions, like seek a doctor to understand symptoms and learn major preven-tion procedures. In the end, but still in the context of the theater, the entire audience participated in a joint reading of the cordel story, along with the mamulengo puppets, which helped in reinforcing the importance of the com-munity's participation to an effective mosquito eradication program. Similar behaviors and reactions were also observed in previous presentations, in three cities and two science festivals, even though no formal evaluation was conducted in those occasions.

Based on our observations, mamulengo theatre has a potential higher level of success in particular cases where the main goal of the project is to provoke attitudinal changes. This happens due to the highly interactive nature of this theatre and the facilitation of "learning through imitation," that is, the change occurs because the consequences of a previous behavior are seen on stage. The story on the cordel book was very simple and easy to follow, as attested by the group reading, where people were responding to the more humoristic or serious aspects of the narrative accordingly. Only a longitudinal study can give us more information on their effectiveness as agents of attitudinal changes, but these preliminary results suggest that traditional artistic expres-sions might act as an excellent format to engage the public in the scientific message, which is a good indicator for better communication (Kahan, 2010).

Communicating Science in Multicultural Societies

Traditional artistic expressions have been the subject of extensive research focusing on its contribution to the sense of identity and the construction of

intangible cultural heritages (see, e.g., Catenacci, 2005; Klimt & Leal, 2005; Rocha, 2009), which can be particularly important in societies made up of citizens from diverse backgrounds struggling to keep an identity while adapting to new habits. When incorporated in science communication projects, traditional artistic expressions have the potential to bring together people from different cultures but with similar references. This aspect is nonnegli-gible since it can influence publics' adhesion to a particular message, and increasing scientific literacy and science-society dialogue can relate directly to levels of public identification to a communication format (Kahan, 2010).

Here we present and discuss the use of two different formats of Brazilian traditional artistic expressions: mamulengo theatre and cordel literature. Our preliminary evaluation highlighted the engagement and dialogical nature of both formats, confirming previous informal observations. In the particular context of control programs for vector-borne diseases, this high engagement might be associated with a higher disposition to behavioral change and coop-eration with health care and prevention programs. Even though our audience was not as mixed as the public found, for example, in bigger cities, it was composed of a heterogeneous group of people in terms of education, ethnic-ity, and age. We used this heterogeneity and these formats as a proxy for other multicultural societies worldwide and related traditional artistic expressions. We hypothesize that incorporating traditional artistic expressions can help design better communication projects that improve engagement and lead to a more open and consistent dialogue between academia and society.

Acknowledgments

We are thankful to all monitors of the Science Park of the Federal University of Rio Grande do Norte (Parque das Ciências—UFRN) for their work in the mamulengo and cordel session that inspired this article. Data collection was conducted during a mam-ulengo and cordel session organized by Parque das Ciências—UFRN. We also wish to thank Rita Ponce, Susanna Priest, and Linda Billings for their critical reading of a previous version of the manuscript and valuable suggestions to improve it.

Declaration of Conflicting Interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Funding

The author(s) disclosed receipt of the following financial support for the research, authorship, and/or publication of this article: RC is supported by POCH—Programa Operacional Capital Humano and funds from the European Social Fund and the

Portuguese Ministério da Ciência, Tecnologia e Ensino Superior, via Fundação para a Ciência e a Tecnologia (Grant SFRH/BPD/110348/2015).

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Magnólia Araújo graduated in biology from the Federal University of Rio Grande do Norte and is a permanent professor at this institution. She has experience in environ-mental microbiology and studies the water quality of reservoirs in the Brazilian semi-arid region. She has investigated about learning difficulties and alternative concep-tions of teachers and students of basic education in biology contents and uses science communication and education for sustainability as elements for mitigation of the stud-ied problems.